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Demonstrations of Lighting as an Aid to Propaganda

ILLUMINATING Engineering is a field where the adage "seeing is believing" applies with special force. Both in the gas and in the electrical industry the importance of an appeal to the eye is becoming increasingly recognized: hence the efforts in both industries to establish showrooms and demonstration centres throughout the country.

At the E.L.M.A. Lighting Service Bureau, which was visited by members of the Illuminating Engineering Society on February 28th, propaganda by the aid of demonstrations has been carried to a fine art. In the ordinary showroom lighting appliances are seen in operation; in some cases their application for the lighting of different types of rooms may even be illustrated. But the feature of the demonstrations at the Bureau is that they dealt essentially with fundamental principles, and they are not intended only to illustrate the advantages of some particular piece of apparatus.

On pp. 109-116 we reproduce Mr. Bush's address and the ensuing discussion. The demonstration theatre has recently been reorganized, and a number of novel devices were shown in public for the first time. All of these were interesting, but we should be inclined to single out for special notice the ingenious small-size models illustrating good and bad methods of lighting in shops and factories. Such models are easily duplicated, and they would form a welcome supplement to lectures on illumination in different parts of the country. The point was raised in the discussion whether the same method could not be applied to street lighting. Something of this kind was contrived in the Research Laboratories of the General Electric Co. Ltd. at Wembley a few years ago. It is, however, somewhat doubtful whether the more intricate problems of street lighting can be dealt with quite so successfully in this way. In practice the space involved is considerable, and it must always be remembered that it is impossible for the observer to be actually *inside* the model, and so to view the conditions as he would in an actual street. Nevertheless the method should be successful if applied only to illustrate certain fundamental principles, such as the effects of glare. More complicated considerations, such as the effect of lack of uniformity in illumination, reflections from polished road surfaces, etc., may require demonstrations on a practical scale—such as those which, it is understood, are being planned in connection with the meeting of the Association of Public Lighting Engineers in Sheffield this year.

The staging of demonstrations is of course only a part of the manifold activities of the Bureau, which were ably summarized by Mr. Bush in his address—he was able to cover a remarkable range of topics in the course of an hour! But we emphasize this feature because it illustrates a wise policy of trusting the public to form a judgment of facts, based on the material put before it—an attempt to persuade, mainly by the evidence of the eye. It has sometimes been complained that people in this country are conservative, that they are unresponsive to new ideas and unduly cautious in accepting suggestions for improvements. It may be that they are not very easy subjects for the art of the "spell-binder." But we fancy that this critical outlook, based on a certain traditional shrewdness and common sense, is not entirely to be regretted. Once an impression is formed it is held tenaciously. It is probable that in the years to come the results of the present educational efforts will become manifest in a widespread improvement in illumination. Indeed, as was remarked in the discussion, the improvement in some directions is already very considerable when one compares the conditions of lighting to-day with those existing in the pre-war period. Attention was drawn in the discussion to the advance in methods of lighting in the leading stores during recent years. The same applies to the field of industrial lighting and office lighting. There are of course other directions in which progress has been less satisfactory—for example, public lighting, but even here the outlook is hopeful.

In the case of illuminating engineering there is special reason to proceed by means of demonstration and persuasion, rather than to attempt to bring about changes by the assumption of authority. For, as we have often pointed out, good lighting is not achieved by the skill of the expert alone. The co-operation of the user is needed in the solution of every problem concerned with applications of light, and his views—even if not always readily expressed in scientific language—are often illuminating. Advocates of good lighting may rest assured that they have a good case to present. They have nothing to lose by taking the consumer into their confidence, and allowing him to draw his conclusions from the evidence put before him.

Standards of Illumination

IN listening to the discussion of Mr. Bush's address (referred to on the previous page), one could not help feeling how the late Mr. Gaster would have enjoyed the remarks of various speakers on the subject of standards of illumination. The general view might, we think, be interpreted to the effect that legal standards can only be imposed after very long and careful research; and that, whilst serving as a safeguard, such standards are necessarily much below values representing good modern practice. It was one of Mr. Gaster's chief convictions that such standards could only be applied when their scientific basis had been thoroughly demonstrated and when they could be backed by the highest available authority. Even so, success demands the wholehearted acceptance of such standards by those in whose interests they are made.

The cautious but sagacious methods adopted by the Home Office Factory Department, which involve enlisting the aid of leading joint industrial councils, have won warm approval from authorities abroad. We believe that the general rise in the standard of industrial lighting in this country is in no small measure due to their educational efforts, and it is improbable that better results could have been obtained by any premature effort to frame rigid standards of illumination.

It was pointed out that in practice a legal minimum tends to become the actual minimum, but this only applies to the less progressive section of the community. A legal standard must necessarily be fixed well below values characteristic of modern practice. Its imposition therefore only serves to bring those who are obviously backward into line with the lowest level of reasonable requirements. The larger and more enterprising section of the community will, in their own interests, pass beyond this limit. The distinction between "minimum" and "good modern practice" has been generally embodied in recommendations on factory lighting, for instance in American codes. It must be remembered also that a legal standard is governed mainly by considerations of the health and safety of workers. It has been said that "one cannot make people efficient by Act of Parliament." It is doubtful if an authority would feel justified in raising a standard on the ground that the increase was necessary to full efficiency of work. The latter consideration is one for the management of factories, who are usually quick to respond to suggestions made in their own interests. Consequently the values of illumination found in progressive factories will generally exceed minimum values imposed in the interests of safety and health.

In what has been said above we have referred primarily to industrial lighting. But similar considerations apply to the lighting of schools and other problems. Before standardization is attained we need "recommendations," and we are in full accord with those who suggest that these recommendations should be backed by the fullest authority available, i.e., they should be capable of justification by reference to scientific data and should not be based solely on prevailing practice. There are in existence bodies such as the Illuminating Engineering Society and the B.E.S.A. in a position to frame such recommendations. The recommendations would naturally require revision from time to time, and for this reason the expression "recommendation" seems preferable to "standard," which implies a fixed and unalterable value.

Office Lighting

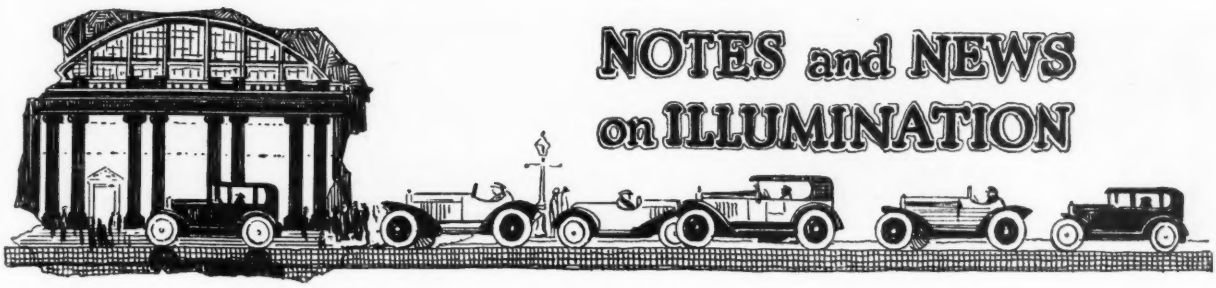
A SIGNIFICANT event on March 21st was the introduction in the House of Commons of Miss Ellen Wilkinson's Office Regulation Bill. Amongst the evils which the Bill is intended to remedy are inadequate lighting, lack of ventilation, insufficient heating and absence of proper sanitary arrangements. Miss Wilkinson was able to quote cases of most unsatisfactory working conditions, and the Bill, which was read for the first time, was sympathetically received.

It must, we think, be conceded that it is an anomaly for offices to be excluded from the provisions of the Factory Act. Contrary to general belief, office work is not infrequently *less* healthy than employment in factories, owing to the fact that in congested city areas unsuitable premises are often used and rooms are overcrowded. A special consideration is the frequent use of basement areas, into which little daylight finds access, so that artificial light has to be used almost continuously. Whilst, from the standpoint of the eye, it is probably better to have ample artificial illumination rather than to risk eyestrain by trying to work under totally inadequate daylight, from the hygienic standpoint the exclusion of daylight is certainly open to objection. The whole question of the lighting of basement premises into which little or no daylight enters deserves serious consideration.

In certain cases the provision of adequate access of daylight and sunlight may be almost impossible or so costly as to be impracticable. It would perhaps be going too far to suggest that such premises should not be used at all for office work. But it should be an obligation on employers to see that their staff have special opportunities of getting out into sunlight and fresh air.

It will be interesting to watch the future of this Bill. Meantime the inclusion of adequate lighting, of equal importance together with sufficient heating and proper ventilation as an essential to health, is a satisfactory step.

Whilst referring to the question of office lighting we may draw the attention of readers to a series of papers on this subject recently read before the Illuminating Engineering Society (U.S.A.). Five papers, dealing respectively with Indirect Lighting, Enclosed Semi-Indirect Lighting, Prismatic Semi-Indirect Lighting, Open Type Semi-Indirect Lighting and Direct Lighting with enclosing globe equipment, were read. The papers were thus designed to illustrate typical modern fittings suitable for office lighting. It is interesting to observe that all the authors contemplated general lighting systems. An illumination of the order of 10 to 15 foot-candles was contemplated, but higher values have been suggested. With such values much of the argument in favour of local units no longer applies. It is significant that many of the latest installations in leading banks, insurance offices, etc., are based on the use of well-designed general lighting units of imposing appearance. It is now less usual to find a multitude of pendant lamps—though we can recall one very pleasing interior, the head office of a leading bank, where the preference for local units has been carried so far as to attach them on wires spanning the room—an arrangement that hardly does justice to the architectural scheme with a lofty dome above! One of the chief advantages of well-designed general lighting units is that they form a part of the general scheme of decoration, in keeping with the dignity of the interior.



Provisions for Lighting in Housing Schemes

In their recent paper before the Institution of Electrical Engineers, Messrs. A. J. Milne and R. H. Rawll made a justified plea of liberal provisions for lighting in " all-electric " homes. In providing for housing schemes there is a tendency to concentrate attention on encouraging the use of electricity for heating, cooking and other domestic purposes, and the lighting is apt to be neglected. This, of course, is a mistake. Here, as elsewhere, the " appeal to the eye " is very powerful, and a well-planned lighting installation is often the means of introducing other applications of electricity. It should not be forgotten that, as the authors pointed out, the average supply undertaking obtains practically half its revenue from the sale of energy for lighting purposes. In some schemes the provision for lighting has undoubtedly been too meagre. For example, in the effort to diminish initial costs of installation to a minimum, too few plug outlets were provided. Actually, a portable unit loses much of its value if it can only be connected to a similar outlet. In endorsing the authors' plea for better electric lighting we need scarcely make it clear that similar considerations apply to gas-lighted houses. Here the heating and cooking load naturally assumes importance, but the advertising value of good lighting is quite as great as in the case of an electrically lighted home, and it is possible that in some cases the full possibilities of the latest forms of well-designed gaslighting units have not been appreciated.

How Much Light Does the User Want?

It is common knowledge that the general standard of illumination has risen very greatly during recent years. We look back with wonder on the dim illumination that was considered adequate in days gone by. One recalls, for instance, that when the first tube railway was opened the daily press referred with enthusiasm to the brilliant lighting—yet the illumination was probably less than a tenth of that available to-day, as was proved by some data presented before the Illuminating Engineering Society shortly before the war. Nowhere is the increase more marked than in factory lighting. To-day 10 foot-candles is becoming quite usual, and in America illuminations of 50 and even 100 foot-candles have been recorded in certain factories. Apart from investigations such as those being conducted by the Illumination Research Committee, we have little scientific data on which to judge requirements. According to *The Electrical World*, the chief factor is the user's natural tendency to use more light if he can get it. A somewhat interesting experiment seems to confirm this. Twenty-five observers were set to work in a laboratory and allowed to choose the illumination they preferred. Unknown to the observers, the maximum illumination available was different on each of the five days of test, ranging from 10 to 100 foot-candles. It was found that the average illumination selected had a direct relation to the maximum available, being in general about half this maximum value. The question arises how far in such circumstances the choice is determined by the actual needs of the observer and how far by the instinctive desire to have a fair share of a good thing. We should like to see a similar experiment conducted with a view to determining the value of illumination which observers thought the *minimum* tolerable; we fancy that this also would be found to depend on the maximum obtainable.

Industrial Lighting

A lecture on " Industrial Lighting " was delivered at the Polytechnic (Regent Street, London) by Mr. J. S. Dow, on March 14th. This lecture, which was originally to have been delivered by the late Mr. Leon Gaster, formed one of the series under the heading of " Courses in Industrial Administration and Works Management " delivered by experts. After illustrating the benefits of good lighting in factories, and pointing out that cost of lighting formed only a very small fraction of total production costs, Mr. Dow dealt with the question: " What is good lighting? " and in so doing gave a summary of the recommendations of the Home Office Departmental Committee on Lighting in Factories and Workshops. He explained how illumination could now be calculated and measured, and how lighting specifications could be prepared. Several forms of illumination photometers, including the " foot-candle meter " and the latest model of the Holophane Lumeter, were exhibited and described. Reference was also made to recent work of the Illumination Research Committee working under the Department of Scientific and Industrial Research, especially in regard to the lighting of printing works, and to the efforts made to establish a relation between conditions of illumination and efficiency and output of work. In this connection Mr. Dow suggested the expediency of emphasizing that good lighting removes handicaps to the worker and enables him to put forth his best efforts—rather than conveying to him the idea that if lighting were improved he would be expected to get through more work in a given time. The concluding part of the lecture contained a summary of efforts to frame regulations on industrial lighting in this and other countries. The distinction between legal minima and values expedient in the interests of efficiency and representing good practice was explained. Instances were quoted of recent installations in which illuminations of 10 foot-candles or more were provided. The lecture was illustrated by a series of lantern slides showing different methods of lighting in various industries. There was an appreciative audience, and at the conclusion of the address a number of questions were put to the lecturer.

Fatal Accidents Due to Bad Lighting

Municipal Engineering recently recorded two cases of fatal accidents due to bad lighting. At an inquest at Southgate on a man killed by a motor car after alighting from a tramcar, it was mentioned that the only light available was derived from a centrally suspended lamp, and that the road on the near side of the tramcar was consequently in shadow. The drawback of shadows cast by vehicles has been urged as an objection against relying exclusively on central lamps, and it has been suggested that some form of supplementary lighting for the edge of the road and footpath is needed. The other case occurred in Hyde Park, where, according to the coroner, there were curious effects of light and shade. A passenger stated that they saw a " black vision " run into the car, which indicates the degree of obscurity. Evidently a higher degree of illumination, coupled with better uniformity, is needed. Another point worthy of notice is the glare from direct reflections of light sources on the shiny surfaces of asphalted roads after rain. Some months ago we referred to the opinion expressed by a public lighting engineer abroad that this trouble is most liable to occur with centrally suspended street lamps. Our comments on this point are quoted in the last issue of *L'Eclairage*.

Restrictions on Illuminated Signs

The rapid development of the illuminated sign has given grounds for concern to those who fear that such displays may become too unsightly. In this country there have been, from time to time, movements designed to limit their use. Fortunately in London designers have shown more restraint than in some other cities. As we remarked last month, the tendency is to aim at originality of effect and artistic design rather than on mere brilliancy, and signs have not reached the gigantic dimensions characteristic of some American cities. According to *L'Electricien*, Paris, traditionally known as the "city of light," has been reacting against the ubiquity of the illuminated sign. There have been measures imposing taxation, and it has recently been decided that in the Place de l'Etoile and in the avenue of the Champs-Elysées illuminated signs shall be entirely forbidden, except certain ones on the riverside.

In commenting on this decision *L'Electricien* concedes that luminous publicity must be conducted with some regard to æsthetic effects, especially in such a city as Paris, with its unique and alluring architecture and historical traditions. But it is not easy to strike a balance between artistic considerations and the claims of commerce, especially in view of the tendency in most cities for the business area to spread and encroach on regions formerly regarded as purely residential.

The Transmission of Light through Cloudy Media

In view of the analysis of the properties of opal glass in Dr. English's recent paper before the Illuminating Engineering Society, it is of interest to notice an investigation, conducted by Messrs. E. Lax, M. Pirani and H. Schönborn, which is being recorded in *Licht und Lampe*. In this case the operators did not work with glass, but with various finely divided particles in suspension; for example, suspensions of aluminium oxide in water and colloidal solutions of paraffin. The influence of the size and number of the particles on the transmission of light, including the percentage of light directly transmitted, is considered, and the influence of wavelength of the light discussed. It is remarked that the Rayleigh formula for the influence of wavelength in the case of very small particles did not apply accurately to the solutions examined. It does, in fact, seem difficult to deduce any formulæ which will apply generally to all forms of cloudy media.

The Use of Light for Testing Polished Surfaces

It is perhaps not generally known that the reflection of light from a polished surface affords a very sensitive indication of the accuracy of the process of polishing. In a method of test recently described in the *Utility Bulletin* light from a small lamp is allowed to fall on the polished surface under examination. The reflected light is received by a photometric cell, the current from which is amplified and recorded by a milliammeter. The indication on this instrument is then taken as a measure of the reflecting power of the material. This method has been applied to the testing of mirrors for motor-car headlights. It is said to have proved very sensitive, facilitating the perception of minute faults which would not have been detected with the aid of a microscope.

The Lighting of Operating Theatres

Although the applications of light as a curative agent have recently been the subject of much study by the leading hospitals, it is to be feared that the ordinary lighting arrangements are not always up to date. The lighting of wards occupied by sick people obviously needs care; a degree of glare that is only mildly irritating to a healthy person may be a real torment to one in a fever. But the most important problem of all is doubtless the lighting of the operating theatre. Some information on this subject was recently given by Mr. H. Logan in an address at the Lighting Engineers' Club of New England (U.S.A.). It was stated that the latest methods of lighting, involving a high illumination and absence of troublesome shadows, had resulted in an average saving of six minutes in operations usually requiring about twenty minutes to perform. The advantages of this saving, both to the patient under anæsthetic and to the surgeon working under high nervous strain, are evident. Such results, if confirmed, would alone justify the use of the very best lighting equipment. This is doubtless one of those cases where the use of "super-illuminations" is fully justified. But it is also yet another instance of the fact that high illuminations alone rarely solve a problem completely. The difficulty is to furnish the requisite high illumination and at the same time to eliminate obscuring shadows from the hands or instruments of the operating surgeon; yet the illumination should not approach the shadowless condition, for such an illumination would defeat its object by preventing minute details of ligament, tissues, etc., being clearly seen. At the recent exhibition of medical appliances in the Central Hall, Westminster, there were on view a number of special lighting units for operating tables, based on the use of the extensive "umbrella" type of reflector. This shows that manufacturers are attempting to deal with the problem. Besides the two requirements noted above, high illumination and correct shadow conditions, a third point—the use of a source giving a light approximately equivalent to daylight in colour—also deserves consideration. One would imagine that in many cases correct appearance of colours would be an important aid to diagnosis, provided the correction can be obtained without the illumination being unduly diminished.

Illumination by Concealed Sources

A contribution by Messrs. T. Matsura and T. Iijima to the *Journal* of the Illuminating Engineering Society in Japan records some experiments on indirect and skylight illumination. The former appears to have been mainly on the cornice-lighting principle, and the efficiency was found to be somewhat low as compared with ordinary indirect lighting from bowls. In the case of the skylight illumination the actual illumination realized was only half the predetermined value. Calculations are notoriously difficult in the case of such installations, but the deficiency is ascribed chiefly to the large amount of light absorbed by the diffusing glass. Apparently a variety of opal glass was adopted, and the transmission was found to be very low compared with that of similar glass as used for bowls. An opal glass skylight might be expected to absorb a considerable amount of light. But it is probable that whatever variety of glass were adopted the efficient of the skylight system would compare unfavourably with that of most ordinary lighting installations. The chief claims of the method rest on æsthetic grounds.

TECHNICAL SECTION

COMPRISING

Transactions of The Illuminating Engineering Society and Special Articles

The Illuminating Engineering Society is not, as a body, responsible for the opinions expressed by individual authors or speakers.

The Manufacture and Properties of Glass and their Application in Illuminating Engineering

(Proceedings at the Meeting of the Illuminating Engineering Society, held in the Lecture Theatre of Holophane Ltd., Elverton Street, Westminster, at 6-30 p.m., on Tuesday, March 13th, 1928.)

A MEETING of the Illuminating Engineering Society was held in the Lecture Theatre of Holophane Ltd. (Elverton Street, Westminster), at 6-30 p.m., on Tuesday, March 13th, Mr. C. C. PATERSON presiding.

After the minutes of the last meeting had been taken as read, the HON. SECRETARY read out the names of new applicants for membership, which were as follows:—

Bone, A. .....Assistant in the Research Laboratories of the General Electric Co. Ltd., Wembley, London, N.W.

Page, A. E. .....Electrical Engineer, 7, Endlesham Road, Balham, London, S.W.12.

The names of applicants presented at the last meeting of the Society were read again, and these gentlemen were formally declared members of the Society.*

The Chairman then called upon Dr. S. ENGLISH to read his paper on "The Manufacture and Properties of Glass and their Application to Illuminating Engineering."†

In opening his address, Dr. S. ENGLISH pointed out that glass is probably the most important tool that the illuminating engineer has at his disposal, whether he is considering natural or artificial lighting. Until recently the scientific investigation of glass and its application had been almost confined to the efforts of a few firms, whose researches were not published. Fortunately there are now research institutions devoted to this subject, and there is a considerable amount of information available to the illuminating engineer. This data is, however, somewhat scattered, and one of the chief objects of the paper was to bring some of this information together.

Dr. English then proceeded to review some of the properties of glass of chief interest to the illuminating engineer. He explained how colouring matters were applied and how the transparency of glasses depended on its ingredients, referring to one problem that has proved a trouble to illuminating engineers—the tendency for glassware to alter in colour under the influence of light. A special problem in the coloration of glasses is afforded by the design of "artificial daylight" units, and Dr. English showed a series of specimens of glass intended for this purpose, illustrating their properties by diagrams showing the distribution of light throughout the spectrum.

Reference was next made to diffusing glasses and to the uses of methods involving opal, etched or sand-blasted glass and glass with a prismatic or irregular surface. The nature of opal glass and the influence of the size of the particles separated from solution, etc., was discussed. Frosted glass was discussed in a similar manner, and a table showing the percentage of light absorbed by various types of glassware was presented. Specimens of opal glassware were exhibited to show their differences in properties, e.g., the complete diffusion of light, coupled with invisibility of the filament, and the effect which gives rise to a reddish image of the filament surrounded by white light. Amongst other matters, the effect of heat on opal glass was considered, and it was pointed out that the provision of a standard quality is a very difficult matter. Experiments were performed to illustrate the difference in the diffusing effect of frosted and opal glasses, and it was explained that the former has one distinctive property—it diffuses light of all wavelengths equally, so that, if the filament is visible at all, it appears in its natural colour. Polar curves showing the light-diffusing power of different types of glass were shown, and the properties of the "pearl" (internally frosted) lamp bulb were discussed in order to illustrate the effects of acid etching.

The final section of the paper dealt with refracting glassware, and the facilities which such glass offers for the control and direction of light were illustrated and explained. Dr. English also described the manufacture of pressed glassware of this description, and emphasized the necessity for scientific accuracy in design.

The CHAIRMAN, in opening the discussion, mentioned that a general invitation had been conveyed to members of the Society for Glass Technology to attend the meeting, and he called upon Professor F. E. S. Turner (Secretary of the Society of Glass Technology) to open the discussion. Others who took part in the proceedings included Dr. W. M. Hampton (Messrs. Chance Bros. & Co. Ltd.), Mr. B. P. Dudding (G.E.C. Research Laboratories), Dr. J. W. T. Walsh (National Physical Laboratory), Mr. Haydn T. Harrison, Mr. E. A. Hailwood (Messrs. Hailwood & Ackroyd Ltd.), Mr. A. Blok, Mr. H. H. Long, Mr. W. C. Raffé, Mr. E. Stroud, Mr. H. Allpress, and Mr. G. Wilson.

The discussion proved to be an interesting one, various topics (such as the coloration of glasses, the manufacturing difficulties affecting standardization, the definition of "diffusing power," etc.) being dealt with.

After Dr. S. English had briefly replied to some of the chief problems raised, the CHAIRMAN proposed a very cordial vote to him for his able paper, and to Holophane Ltd. for their hospitality. The vote of thanks was carried with acclamation, after which those present adjourned to the showrooms for light refreshments. There was a general feeling that this had proved to be one of the most enjoyable and instructive meetings ever arranged by the Society.

* *The Illuminating Engineer*, March, 1928, p. 75.

† The full text of Dr. English's paper, together with the complete discussion, will appear in our next issue.

National Illumination Committee of Great Britain

(Affiliated to the International Commission on Illumination)

Constituted by

THE ILLUMINATING ENGINEERING SOCIETY
THE INSTITUTION OF ELECTRICAL ENGINEERS
THE INSTITUTION OF GAS ENGINEERS
THE NATIONAL PHYSICAL LABORATORY

in co-operation with

INDUSTRIAL TECHNICAL and PROFESSIONAL ASSOCIATIONS and GOVERNMENT DEPARTMENTS interested in the subject of illumination

Representatives Nominated by the Constituent Associations of the Committee

BY THE CONTRIBUTING ASSOCIATIONS:—

Illuminating Engineering Society:
H. BUCKLEY
J. S. DOW
DR. A. H. LEVY
C. C. PATERSON
A. P. TROTTER.

Institution of Gas Engineers:
F. C. BRIGGS
W. J. A. BUTTERFIELD
CAPT. W. J. LIBERTY
H. E. COPP
R. WATSON.

Institution of Electrical Engineers:
P. GOOD
LT.-COL. K. EDGCUMBE
H. T. HARRISON
PROFESSOR J. T. MACGREGOR MORRIS
J. M. G. TREZISE.

National Physical Laboratory:
SIR J. E. PETAVEL
DR. J. W. T. WALSH.

BY THE CO-OPERATING ASSOCIATIONS:—

British Electrical and Allied Manufacturers' Association:
G. CAMPBELL
T. E. RITCHIE.

Electric Lamp Manufacturers' Association:
P. J. BREWER
C. W. SULLY.

General Post Office:
MAJOR H. C. GUNTON.

His Majesty's Office of Works:
A. G. RAMSEY.

Home Office:
D. R. WILSON.

Institution of Municipal and County Engineers:
J. SUTCLIFFE.

Institution of Public Lighting Engineers:
E. J. STEWART.

Medical Research Council:
DR. H. HARTRIDGE.

Ministry of Health:
R. UNWIN.

Ministry of Transport:
E. S. PERRIN.

National Gas Council:
R. WATSON.

Railway Clearing House:
W. C. GOODCHILD
MAJOR G. H. SPITTLE.

Society of British Gas Industries:
F. J. GOULD
H. TALBOT.

Society of Glass Technology:
B. P. DUDDING.

The Committee has made the following appointments:—

Representatives of Great Britain on the Executive Committee of the International Commission on Illumination:—

P. GOOD, R. WATSON and (ex-officio) LT.-COL. K. EDGCUMBE.

OFFICERS:

Chairman: LT.-COL. K. EDGCUMBE.

Vice-Chairmen: C. C. PATERSON and R. WATSON.

Hon Treasurer: W. J. A. BUTTERFIELD, 66, Victoria Street, London, S.W.1.

Hon. Secretary: H. BUCKLEY, The National Physical Laboratory, Teddington, Middlesex.

National Illumination Committee of Great Britain

Chairman's Report for the year 1927, presented at the Annual Special Meeting on Friday, 3rd February, 1928

THE work of the Committee during the past year has been mainly concerned with the widening of its constitution and with the meeting of the technical committees of the International Commission on Illumination at Bellagio.

The widening of the constitution of the Committee arose from the feeling that the National Committee, as originally constituted, was not sufficiently representative of the illumination interests which had developed during the past ten years. As regards national standardization work, the National Committee in 1924 asked the British Engineering Standards Association to set up a Sectional Committee on illumination to deal with this subject. The Sectional Committee which has been formed is representative of all bodies interested in illumination matters, and the experience of its working has been particularly happy.

It was felt that as regards the international relations of the Committee a similar widening of its representative character would place it in a much stronger and more authoritative position abroad. In consequence, it was decided to amend the rules of the Committee to make such a change in its constitution possible. Invitations to co-operate in the work of the Committee were accordingly sent and accepted by the following organizations, so that the National Committee now consists of members representing the following:—

Illuminating Engineering Society.
Institution of Gas Engineers.
Institution of Electrical Engineers.
National Physical Laboratory.
British Electrical and Allied Manufacturers' Association.
Electric Lamp Manufacturers' Association.
General Post Office.
His Majesty's Office of Works.
Home Office.
Institution of Municipal and County Engineers.
Institution of Public Lighting Engineers.
Medical Research Council.
Ministry of Health.
Ministry of Transport.
National Gas Council.
Railway Companies of Great Britain.
Society of British Gas Industries.
Society of Glass Technology.

The International Commission on Illumination should have met in plenary session in America in 1927, but in view of the fact that a number of national committees had only recently become members of the Commission it was thought advisable to have a meeting of the technical committees only, and to postpone the plenary meeting until 1928. It is hoped that the advantages of the meeting at Bellagio will be reflected in the proceedings of the plenary meeting in America, which is to take place in September next.

The Bellagio meeting of the International Commission on Illumination from August 31st to September 3rd, 1927, was attended by seventy representatives from ten different nations. A short account of the meeting was prepared by the British delegates and circulated to members and others interested.

The British delegates were Lt.-Col. K. Edgcumbe, Mr. W. Bush, Mr. L. Gaster, Mr. P. Good, Mr. L. W. B. Jolley, Mr. J. Macintyre, Dr. E. H. Rayner, Mr. R. Watson, Mr. E. Willis and Mr. H. Buckley, while Mr. C. C. Paterson and Dr. J. W. T. Walsh attended in their respective official capacities of honorary and general secretaries to the Commission.

The main result of a very successful meeting was the reorganization of the technical committees of the Commission, whose numbers were increased to fifteen, and the arrangement by which each country takes charge of one, or in some cases two, subjects in a "secretariat" capacity. In this way the Central Bureau is relieved of a large amount of administrative work, and it is hoped that the responsibility which is now thrown on the various national committees will stimulate their interest and lead to more efficient operation of the technical committees.

The British delegates provisionally accepted the secretariat responsibility for the two subjects of Daylight Illumination and Coloured Signal Glasses. This acceptance was confirmed at the first meeting of the National Committee after the Bellagio meeting. The sub-committees appointed by the National Committee to deal with these subjects have already had several meetings and are in touch with the foreign co-operating committees. In addition, the National Committee is co-operating in the work for which the secretariat responsibilities have been allotted to other countries. It is already discussing Street Lighting and Diffusing Glassware with Germany, Automobile Headlights with America, Definitions and Symbols with France, the Photometric Vocabulary with Switzerland, and it appears that there is every prospect of a successful meeting in America this year.

Although it occurred after the close of the year with which this report is concerned, mention must be made of the death of Mr. Gaster, one of our oldest and most esteemed members. Mr. Gaster's association with the illuminating engineering movement and with the National Illumination Committee dates from their beginning, and he has played a large part in their development and progress. His genial and kindly presence will be missed not only in our own deliberations but at all meetings of illuminating engineers.

K. EDGCUMBE, *Chairman.*

3rd February, 1928.

British Engineering Standards Association

Report of Work of the B.E.S.A. Illumination Section during the year 1927, prepared for the British National Committee on Illumination

ALTHOUGH only one specification, that for Street Lighting (B.S. Specification No. 307, 1927), has been actually published during the year, the Illumination Section of the B.E.S.A. has been very active during the past twelve months, and has carried out work of great educational value. The Sectional Committee has held two meetings, and the work of the Sub-committees has been as follows:—

Sub-committees 1 *Portable Photometers* and 2 *Nomenclature and Definitions*, having completed their work for the time being, no meetings of these Sub-committees have been held.

Sub-committee 3, *Translucent Glassware*, has completed its specification for an Illumination Fitting of Translucent Glassware for Interior Lighting, which has now been approved by the Sectional Committee and the Publications Committee, and will be issued in the course of the next two or three weeks.

A proposal to issue the list of Neck Dimensions contained in this specification also as a separate specification, modifying it if necessary to include dimensions for other types of illumination glassware, has been agreed to and the panel which drew up this list, under the chairmanship of Mr. W. J. Jones, has been asked to go into the matter and see whether any modification on the lines indicated is considered necessary.

As the membership of this Committee and of *Sub-committee* 4, *Industrial Reflectors*, was practically identical and the work coming before the two Committees was tending to overlap, the Sectional Committee has combined these two Committees under one, which is now known as *Sub-committee No.* 3 *on Lighting Fittings*, and is under the Chairmanship of Dr. J. W. T. Walsh.

The principal work of this Sub-committee during the coming year will be in connection with the meeting of the International Illumination Commission to be held in America in September, the British National Illumination Committee having appointed this Committee, with the concurrence of the Sectional Committee, to act on its behalf in preparing the British views to be presented to the I.C.I. The particular pieces of work to be dealt with are "Diffusing Glassware" and "Light Flux Distribution," and two small panels have been appointed to prepare concrete proposals for submission to the full Sub-committee.

The *Sub-committee* 5, *on Street Lighting*, as mentioned in the opening paragraph, has completed its specification, which was given a very wide publicity before being issued, over 1,000 copies having been distributed to the various Institutions and Associations interested. It was also discussed before the Institution of Electrical Engineers, the Council of the Institution of Gas Engineers, the Illuminating Engineering Society and the Institution of Public Lighting Engineers. In principle the specification was most favourably received and awakened a wide interest, and the criticisms presented, which were considerable, were most helpful and constructive. As a result of these criticisms the Sub-committee made some radical changes in the specification, and they hope that now it will receive the fullest support from all concerned with this important question of Street Lighting.

As in the case of Sub-committee No. 3, the British National Illumination Committee has, with the concurrence of the Sectional Illumination Committee, appointed this Sub-committee to act on its behalf in preparing the British views to be presented to the International Illumination Commission, and the Committee is now pressing forward with this work. It will be remembered that when the Committee was first appointed it was considered better, in view of the complicated nature of the work, to nominate those who were essentially illuminating engineers rather than to form it in quite the same way as most of the other B.E.S.A. Committees, the manufacturing interests being brought in through the wide circulation of the draft before its publication. The first portion of its work, however, now being completed, the Committee has been reconstituted to include all interests concerned.

Sub-Committee 39/6, *Electric Lamps.* This Sub-committee was transferred from the Sectional Electrical Committee to the Sectional Illumination Committee in March, 1927, as it was felt that now the B.E S.A. has an Illumination Section that section was the natural place for the Lamp Sub-committee. Lamps are to-day looked upon much more as a source of illumination than as current-carrying devices, and there needs to be close co-operation between the lamp manufacturers and the illumination industry. A fresh revision of the lamp specification, B.S. Specification No. 161, 1925, has been commenced, one of the chief features of which will be a reduction in the tolerances allowed on the light-centre lengths.

Sub-committee 39/7, *Photometric Integrators.* The work of this Committee is proceeding satisfactorily, but owing to this subject being a comparatively new one a great deal of research work is having to be carried on, which of necessity makes progress somewhat slow.

3rd February, 1928.

Co-ordination of International Technical Meetings

International meetings and congresses to discuss technical subjects are continually increasing, and the need for some machinery to prevent overlapping of effort is generally appreciated. On the occasion of the meeting of the International Electrotechnical Commission in Italy last year, the opportunity was taken to review this question at an unofficial meeting of representatives of several international organizations. Seven such bodies were represented.

In January of this year a first meeting of the unofficial "Comite d'Entente" was held in London at the offices of the I. E. C. Representatives of the following bodies were present: International Illumination Commission, World Power Conference, International Consultative Committee on Long Distance Telephony, International Union of Producers and Distributors of Electrical Energy, International Standards Association (in process of formation), and International Electrotechnical Commission. Such matters as the interchange of information on dates and programmes, and the formation of joint international committees, were discussed. It was finally decided to keep the unofficial committee in being, with the I. E. C. as convener, and to call another meeting a year hence, by which time the various organizations would have had time to consider these proposals.

Recent Activities of the E.L.M.A. Lighting Service Bureau

(Address delivered by Mr. W. E. Bush, Manager of the E.L.M.A. Lighting Service Bureau, on the occasion of the Visit of Members of the Illuminating Engineering Society on Tuesday, February 28th, 1928)

THE Lighting Service Bureau of the Electric Lamp Manufacturers' Association is the recognized centre of the Association for the propagation of better electric lighting, and has been in operation for three and a half years. The Bureau was inaugurated with the object of rendering service to all sections of the electrical industry, and of providing a central clearing-house for the dissemination of electrical lighting data to the public.

At the inception it was decided that the demonstration method of presenting better lighting should form an important feature of the Lighting Service Bureau programme, and a suite of rooms situated at 15, Savoy Street, Strand, W.C.2, were acquired.

Before proceeding to outline in detail the work of the Bureau I will briefly describe the equipment in the various demonstration rooms, and the purpose for which it is used.

The Ideal Showroom.

One of the important problems confronting the electrical industry is to discover means for educating the public with regard to the correct principles of illumination in the home. The cleanliness and convenience of electric light is well established, but its flexibility and possibilities as a decorative and furnishing medium are not fully appreciated. This is probably due to the fact that electrical showrooms throughout the country have not been designed so that the full advantages of electric lighting could be demonstrated to existing and prospective electricity consumers.

Fig. 2.—Miniature Bedroom and Sitting Room.

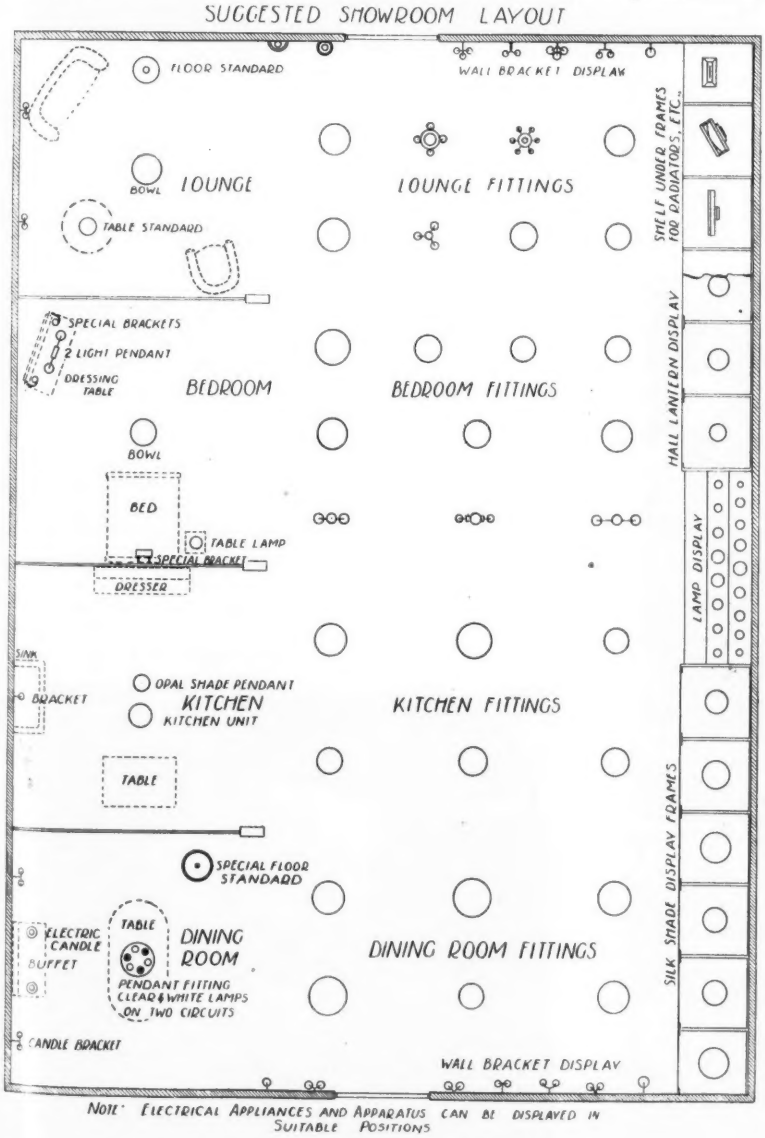


Fig. 1.—A Plan of the Ideal Showroom.

In order to promote interest amongst electrical retailers in developing lighting service showrooms, the Bureau has designed a model showroom layout which it is considered could be incorporated in the premises of most supply undertakings and electrical contractors. One side of the room is divided into four compartments which represent a dining room, kitchen, bedroom, and drawing room. Each compartment contains lighting equipment suitable to the interior, and facilities are provided for demonstrating the right way and the wrong way of illuminating the various rooms.

On the ceiling opposite each interior appropriate fittings for that interior are suspended. These are fastened to the ceiling by means of special quick-fixing ceiling plates, which enable any fitting to be readily taken down and demonstrated in the miniature room at the request of a customer. By this means the effect of the illumination provided, in addition to the appearance of the lighting unit, can be fully appreciated. Fig. 1 shows a plan of the "Ideal Showroom," and Figs. 2, 3 and 4 are photographs of the miniature rooms.

In the "Ideal Showroom" is also located a special lamp cabinet, which is so arranged that, when a particular lamp is illuminated, the number of hours for which that lamp will operate for one unit is indicated on a luminous sign. Various cabinets showing the progress and utility of electric lighting are also available for inspection. It should be noted that, if this plan were adopted by an electricity showroom, a full range of appropriate electrical appliances can also be arranged in the centre of the room.

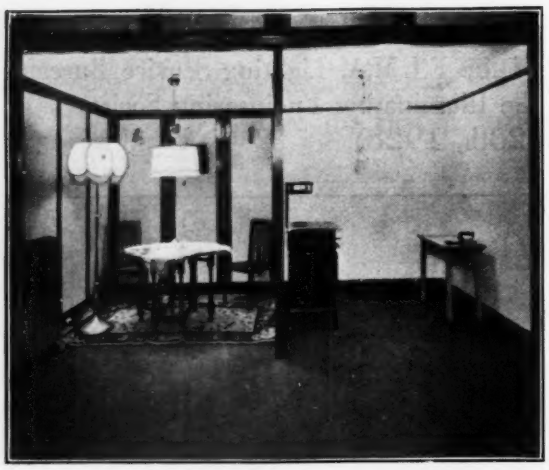


FIG. 3.—Miniature Rooms: Sitting Room on left; Kitchen on right.

LECTURE THEATRE.

The equipment in the lecture theatre is so arranged that the majority of lighting systems for commercial and industrial purposes can be demonstrated. The procedure varies with the type of audience which is attending a lecture, but the usual practice for a non-technical audience is to demonstrate successively the various systems of illumination which have existed from the carbon-lamp days until the present time.

Foot-candle meters are available, which enable visitors to measure the intensity of illumination provided by each system, and thereby form a complete comparison in their own minds between the early and the modern systems. Semi-technical data to suit the audience is presented by the lecturer, the economic side of good lighting being particularly stressed.

On the other hand, at times lectures are given to learned societies or associations, in which event the lecture is of a more technical nature and delivered by an expert of the association or the associated companies.

FIG. 4.—Miniature Rooms: Another View.

Over 1,000 lantern slides dealing with various applications of lighting, or showing technical data, are available for lecture purposes. Fig. 5 shows a view of the main lecture room.

REVOLVING HOUSE.

A revolving electric house has been specially built in order that the principles of good home lighting may be demonstrated to large audiences. The revolving platform enables a quick change from one room to another to be made. Alternative methods of illumination are presented by swinging round the upper portion of the walls, thus providing unlimited lighting changes for each setting. Fig. 6 shows a picture of the revolving electric house.

MODEL SHOP WINDOW.

A model shop window is available for giving lighting demonstrations to groups of shopkeepers, chambers of trade, etc. The window is fitted with a full range of lighting equipment, including colour lighting, thus enabling the lecturer to present a series of methods of window illumination from the crudest form to the most modern methods employing up-to-date reflectors.

DEMONSTRATION ROOM.

Fig. 7 shows a general view of the main demonstration room, where the more specialized applications of electric lamps are exhibited. Three cubicles have been erected in order to demonstrate the old and the new methods of illumination for a shop, a factory, and a schoolroom. These interiors are particularly useful for discussing

FIG. 5.—The Main Lecture Room.

lighting problems with individual visitors or small groups. The following is a brief description of the various pieces of demonstration apparatus that are located in the demonstration room.

Floodlighting.—A range of floodlight projectors is mounted on portable trucks, enabling the lecturer to project beams of light in various parts of the room. Illuminated transparencies of actual installations of floodlighting, as applied to commercial and industrial applications, are fixed on the walls. Technical data relating to the subject is provided in a handbook. Fig. 8 shows a picture of the floodlight projectors.

Experimental Shop Window.—Experiments on the application of coloured lighting for use in shop windows are constantly being carried out at the Bureau. Fig. 9 illustrates the "Lady of Light" setting, which demonstrates applications of coloured illumination in a striking manner. The various colour-lighting units, spotlights, etc., are controlled by a motor-driven flasher.

Poster Lighting.—The illumination of posters and hoardings is a field which needs serious cultivation by the electrical industry. In order to demonstrate various methods of lighting a full-size poster has been installed

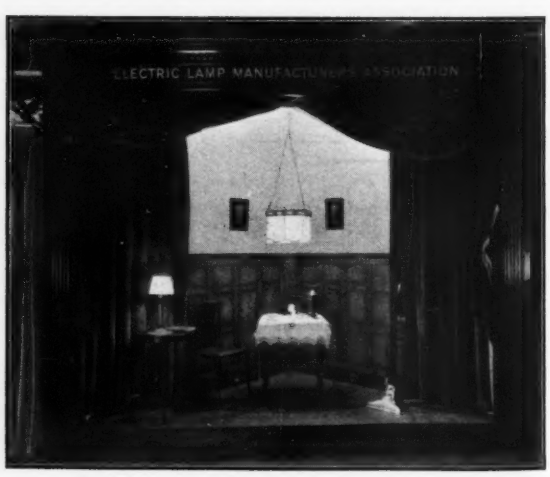


FIG. 6.—The Revolving Electric House.

FIG. 7.—A General View of the Main Demonstration Room.

(Fig. 10). The demonstration indicates the desirability of obtaining some modification of the present legislative restrictions on the limit of projection permitted from building fronts when installing lighting equipment. The illumination of the poster, lighted with the same wattage lamps and similar reflectors at 4 ft. 6 in. in front of the poster, is insuperably better than when restricted to 2 ft. 6 in. When the hoarding is set back it is often advantageous to illuminate the poster from floodlighting units, and this method is illustrated and can be compared with the illumination provided by overhead reflectors. The use of the daylight lamp to enhance the appearance of particular posters is also shown. Floodlighting by means of daylight lamps can be demonstrated and compared with the illumination provided by overhead reflectors.

Model Retail Shop.—Fig. 11 shows a close-up view of a model shop, which is fitted with the old and the new methods of lighting. For the former small drop pendants fitted with miniature opal shades and lamps have been installed, and, when illuminated, produce a glaring and dismal lighting effect. By means of a special automatic switch the lighting system is changed to show the effect produced by concealed reflectors in the window, and enclosing units in the interior. Showcase lighting is also incorporated in order to emphasize its importance to the shopkeeper.

Model Factory.—The model factory is fitted with scale models of various machines. These are operated by means of a small motor in a lean-to shed at the back of the model. The lighting from miniature enamelled-iron shade pendants is contrasted with the illumination provided by overhead standard dispersive reflectors. The illumination intensity of the latter system is 10 foot-candles. By means of this model it is possible to demonstrate in a convincing manner the disadvantages of glare and gloom which result from the employment of obsolete lighting methods, and to contrast it with the improved appearance of the shop when lighted in accordance with modern methods (Fig. 12).

DEMONSTRATION CABINETS.

A large selection of demonstration cabinets are available in the Lighting Service Bureau. These have been so designed in order that the old and new methods of lighting for various interiors can be seen at a glance. Demonstration cabinets of this nature are particularly useful at exhibitions (Fig. 13).

NEW DEMONSTRATION EQUIPMENT.

In addition to the foregoing, new demonstration equipment is at present under construction. In a recess in the lecture room a scale model of a street is under construction which, when completed, will be similar to the picture shown in Fig. 14. The model will be complete with buildings, shop windows, floodlighting, and sign installations, and will incorporate a full range of street-lighting equipment to scale. It is considered that this exhibit will be found very useful in stimulating interest amongst lighting committees from various parts of the country who will be invited to inspect it.

A new demonstration room is being equipped in which superlighting effects incorporating colour lighting, sky lighting, artificial sunshine, panel lighting, and the new art lighting can be demonstrated.

LECTURE SERVICE.

The Lighting Service Bureau organization is constantly engaged in giving lectures to organized groups in various parts of the country, and this service is

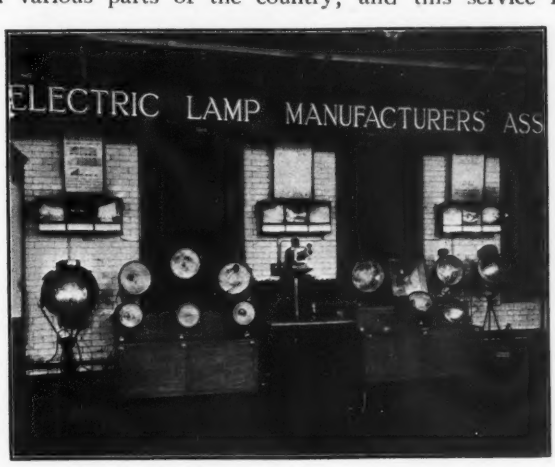


FIG. 8.—An Assembly of Floodlighting Projectors.

FIG. 9.—The "Lady of Light": A Display illustrating the Effects of Coloured Light.

reaching extensive proportions; for example, in the month of November 58 lectures were given to audiences totalling 5,500 people. The audiences are of a varied character, and include such organizations as Chambers of Commerce, Rotary Clubs, Science Masters' Association, Health Societies, Electrical Trade Organizations, Technical Colleges, etc. The Bureau has recently been conducting a series of lectures to boys from central schools, who display a keen interest in their visit to the demonstration rooms.

ILLUMINATION BULLETINS.

The Bureau issues from time to time illumination bulletins of a technical character dealing with various spheres of lighting, principally for the electrical trade, and, in addition, popular booklets are published for general distribution to consumers. Fig. 15 is a composite picture showing the publications which have been issued by the Lighting Service Bureau.

ILLUMINATION DESIGN COURSES.

Since the inauguration of the Lighting Service Bureau 17 Illumination Design Courses have been conducted in London and the Provinces. The attendance at these courses consist chiefly of representatives from supply undertakings, electrical wholesalers and electrical contractors. The subjects discussed are of a varied character, and deal with both the technical and commercial aspects of electric lighting practice.

The eighteenth Illumination Design Course will be held during the first week of May, for which special preparations are being made in an endeavour to make it the most instructive and impressive course of the series. The subjects will be treated in a more advanced manner than previously, and should appeal particularly to engineers with some knowledge of lighting.

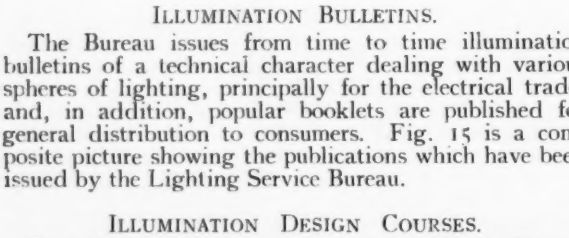


FIG. 10.—Showing Illumination of Full-size Poster.

LIGHTING INVESTIGATIONS.

In order to provide fundamental data for the preparation of handbooks, lectures and lighting campaigns, the Lighting Service Bureau conducts from time to time investigations in various lighting fields.

A survey of lighting in retail shops was conducted in 1925, and a paper on this subject was presented before the Illuminating Engineering Society by Mr. W. J. Jones and Mr. H. Lingard.

Similar investigations on the lighting of the engineering industries were conducted last year by Mr. J. L. H. Cooper, who presented a paper before the Illuminating Engineering Society in December last.

Investigations are, at the present moment, being conducted on lighting in the textile industries and school lighting and lighting for sports.

The Bureau has also made a very close study of the subject of floodlighting, and a paper was presented to the Illuminating Engineering Society on this subject by Messrs. W. J. Jones, H. Lingard and T. Catten, and an illumination bulletin dealing with the subject has recently been issued.

One member of the engineering staff is at present engaged on fundamental investigation into the design and characteristics of electric signs, and already much interesting information has been obtained on this subject.

TECHNICAL WORK.

Although it will have been observed from the above outline that the various activities of the department are mainly of a practical character, the more fundamental matters in lighting are not neglected. Naturally, the more common aspects of illumination receive greatest attention, but an endeavour is made to conduct this work with a knowledge of the scientific advancements which

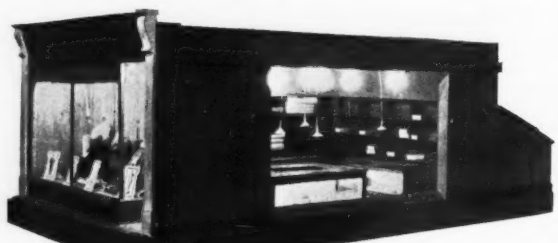


FIG. 11.—Model Shop Lighting Display.

are continually taking place in this industry. The Bureau takes great pains to maintain a well-balanced view of lighting, bearing in mind the physiological, physical and commercial aspects of the subject. The more technical aspects of the subject receive attention from specialists on the engineering staff.

The Lighting Service Bureau is represented on the majority of committees dealing with scientific aspects of illumination, and although the data presented to the trade and the public is of a simplified nature, it is, nevertheless, based on a scientific foundation. A considerable amount of discrimination is necessary in the presentation of the subject of illumination by the Bureau, according to the character of the audience to which an appeal is made. For example, a Chamber of Commerce would obviously require the presentation of the subject of shop-window lighting to be dealt with in a totally different character from that of a group of illuminating engineers, while the general subject of lighting presented to, say, the Science Masters' Association would obviously be of a more technical character, both in language and in fact.

LIGHTING CAMPAIGNS.

National lighting campaigns form an important part of the Lighting Service Bureau's activities. A National Shop Lighting Campaign was conducted in 1925, and, as a result of the active support which was forthcoming

FIG. 12.—Model Factory Lighting Installation.

from the members of the E.L.M.A. and other manufacturers of lighting equipment, this co-operative effort for the improvement of the lighting of retail shops and shop windows throughout the country proved an unqualified success. It is only necessary to compare the position of shop-window lighting to-day with the standards that existed two or three years ago in order to realize the remarkable effect which this campaign had on the retail traders throughout the country.

The National Home Lighting Campaign, which was conducted jointly by E.D.A. and E.L.M.A. in 1926–1927, was the biggest effort which has ever been made in this country to improve the standards of illumination in the home. Its effect was far reaching, and it is still too early to attempt to appraise results. An analysis of the fittings that were selected by the competitors in the national ballot definitely indicates that they had studied the lessons that were given in the primer which was distributed to one and a half million people in the country.

GENERAL.

It is the established policy of the Bureau, in presenting the case for better lighting to the public, to avoid, as far as is reasonably possible, the introduction of highly technical and scientific matter. It is considered that the state of electric illumination has now reached the position where it is no longer necessary, or desirable, to "split" lumens in designing an illumination scheme. Intensities of illumination in all fields of lighting have been steadily increasing since the introduction of gasfilled lamps, and standards of illumination which appeared in textbooks ten years ago are now, by general consent, out of date. There does not appear to be, at the moment, any scientific foundation for the establishment of definite standards of illumination for specific industrial operations, except, perhaps, those emerging as a result of the investigation by the Department of Scientific and Industrial Research, "The Relation Between Illumination and Efficiency in Fine Work (Typesetting by Hand)." Apart altogether from the questions of visual capacities, the psychological factor is now recognized as being of considerable importance.

Similar characteristics apply to lighting considerations in connection with commercial interiors. For example, in pre-war days a shopkeeper would provide in his window sufficient illumination to make his goods and their corresponding price tickets discernible to prospective customers. In other words, visibility was the principal criterion upon which illumination values were fixed. In these days of further experience, considering again the case of the shopkeeper, he has discovered that the advertising and sales-compelling value of high levels of illumination is of much greater importance than the mere question of visual performance. This being the case, it would seem impossible, and, I consider, extremely undesirable, for the electrical industry or any scientific institution to attempt to fix general illumination standards for industry and commerce. At the most, we should do no more than offer recommendations that represent, as near as we can judge them, the average conditions that exist at the time that the recommendations are made, and this should be done with the full knowledge that such recommendations are liable to revision in an upward direction as time progresses.

It is sometimes overlooked, even by expert illuminating engineers, that, in the more progressive branches of industry and commerce, lighting is now being installed in quantities which a few years ago would have been considered incredible and grossly extravagant. It is no uncommon thing to find a shop window, in these days, which has a connected load of 6 or 7 horse-power for lighting purposes, and once an installation of this character is installed in any given community of traders it is found that the adjacent shopkeepers will steadily improve their installations until they have reached the high standard set by the trader who set the pace.

In view of the prolific use which is now being made of electrical illumination in industry, because of its productive value, and in commerce due to its sales and advertising value, it is not considered necessary by the Bureau in the propagation of electric lighting to deal

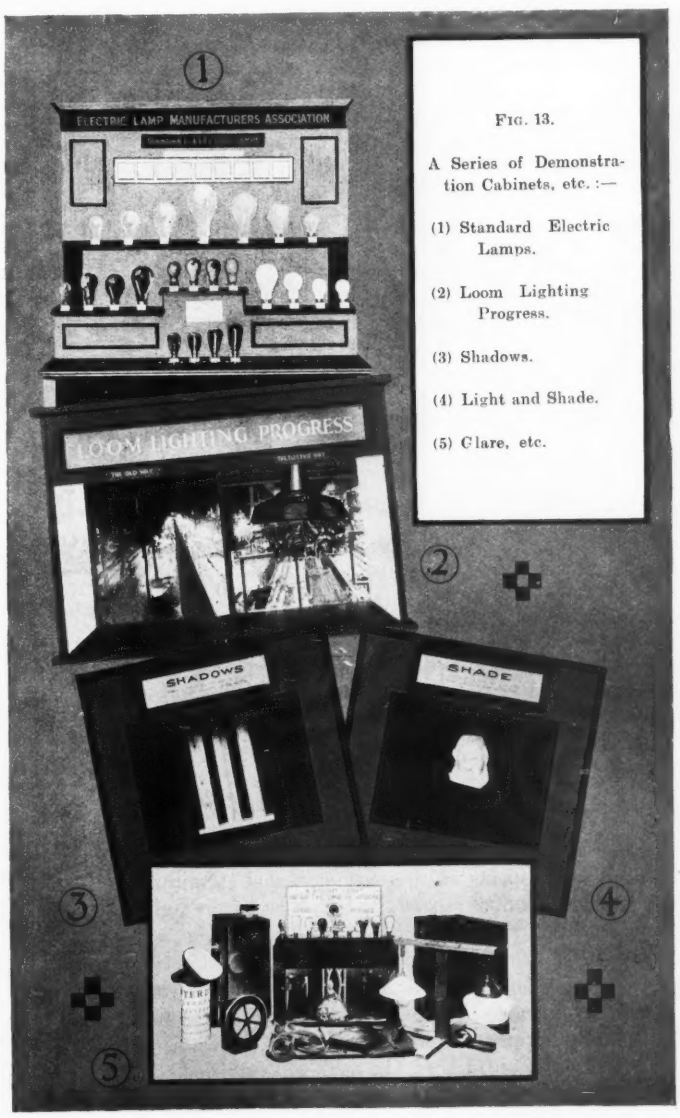


FIG. 13.

A Series of Demonstration Cabinets, etc. :—

(1) Standard Electric Lamps.

(2) Loom Lighting Progress.

(3) Shadows.

(4) Light and Shade.

(5) Glare, etc.

with the question in such a scientific manner as was considered desirable during the last decade. In pre-war days careful calculation was necessary, and the utmost care had to be given to the design of an installation when the difference between 3 and 3½ foot-candles was considered a vital matter; but in these days, when intensities of 10 and 20 foot-candles are common, and the cost of producing light is much cheaper, the same attention is not justified. Whilst taking care, therefore, to safeguard the interest of the consumer, in obtaining a high degree of possible efficiency from his lighting installation, the Lighting Service Bureau endeavours to so simplify its recommendations that an installation can be planned by the adoption of standardized equipment and formulæ which will produce a result consistent with the canons of recognized good illumination practice. In other words, the Bureau presents the case for good lighting in tabloid form without worrying the uninitiated consumer with the scientific constituents of the remedy. For instance, if we consider the field of shop-window lighting it will be realized that shop window reflectors have reached a high degree of standardization, and, when properly installed in a window with standard lamps, will give approximately standardized results in foot-candle intensities.

The other factor besides foot-candle intensity which controls the brightness of a window is the reflectivity of the display, and over this we can have no control. The Bureau, therefore, in order to make simple recommendations for the lighting of shop windows of the ordinary type, came to the conclusion that it was unnecessary to suggest elaborate calculations to the shopkeepers, or to electrical contractors for that matter, in order to estimate the wattage of the lamps which

FIG. 14.—A Scale Model of a Street, complete with buildings, shop windows, floodlighting, etc.

the London and Provincial Lighting Service Bureaux has had considerable influence in recent years in improving the standards of illumination in the areas which they serve.

FIG. 15.—Composite Picture showing Publications of the Lighting Service Bureau.

should be employed, and found that a recommendation based upon watts per foot run was satisfactory for all practical purposes.

The science of illumination has always been considerably in advance of its application, and this condition is due to the difficulty in acquainting vast numbers of electricity consumers with the very rapid progress in the development of lighting equipment, and the economic aspects of modern electrical illumination. It is due to a realization of the fact that better lighting is to the direct interest of the public, as well as to the manufacturer, that the Electric Lamp Manufacturers' Association inaugurated the Lighting Service Bureau.

Lighting service bureaux, controlled and mainly financed by supply undertakings, electrical wholesalers and electrical contractors, have been established for similar purposes in Newcastle, Manchester and Glasgow, and it is generally recognized that the joint effort of

Discussion

The CHAIRMAN (Mr. C. C. Paterson) said that Mr. Bush, in an address lasting less than one hour, had covered a great deal of ground and had aptly illustrated the chief aim of the E.L.M.A. Lighting Service Bureau, which was the popularizing of good lighting.

Lt.-Col. K. EDGCUMBE likewise expressed his appreciation of the address, and remarked that the great progress that had been made in the application of proper methods of lighting during the last few years was due very largely to the efforts of this organization. It was only necessary to recall the change in methods of shop lighting, e.g., the frequent misuse of imperfectly screened lamps, which threw their light outwards into the eyes of people on the pavement, in many shops prior to the war, as compared with the very much better methods prevailing to-day. This applied particularly to the leading stores, most of which were now admirably lighted. In regard to hoarding lighting he was not quite sure that all people would agree that illumination at

night was an unmixed blessing, because many of them were unsightly objects by day!

Mr. A. BLOK referred to the course in illuminating organized by the Bureau, to which Mr. Bush had made only a very brief and modest reference. He thought that it would be useful if fuller information could be given regarding the nature of these courses, and the kind of people for whom they were intended, as this was undoubtedly an important feature in the work of the Bureau. Another service rendered by the Bureau which seemed very valuable was the display of typical lighting appliances and fittings. Developments were so rapid that it was extremely difficult to keep abreast of them, and the choice of units, signs and equipment generally for demonstration purposes must surely present difficulties. He occasionally had an opportunity of seeing catalogues of lighting fittings from abroad, some of them very beautiful in design, and it would be useful if these, too, could be seen so that lighting engineers in this country might be kept in touch with what was being done elsewhere.

He gathered that Mr. Bush was not in favour of fixed standards of illumination for most purposes, and he would like to hear the views of other speakers on this subject. Apart from the compulsory imposition of standards upon industries which were amenable to official control, he thought it desirable that definite values should be prescribed with as much authority as possible, rather than that the general raising of the standard of illumination should be left to the more subtle process of persuasion. In America the drafting of standards appeared to be more advanced, as was illustrated by their Codes for School and Factory. It was sometimes urged, as an objection to framing standards, that they became out of date. The obvious rejoinder was that the standards should be revised periodically. He believed that in such matters it was preferable to be able to present definite recommendations backed by the maximum amount of authority, rather than to rely entirely on persuasion, and on pointing out the drawbacks of inadequate lighting.

He wished to compliment the E.L.M.A. on their exceedingly fine organization and the excellent series of demonstrations that had been given. Possibly the key to success in an educational campaign was to begin at the very beginning. This had recently been impressed on him when inspecting a block of offices where very inefficient methods of lighting were used. He was well aware that the staging of demonstrations such as those they had witnessed involved a great deal of preliminary work. From his experience in his early days as assistant to Professor Fleming—one of the most successful public lecturers and demonstrators in this country—he realized how many rehearsals must precede successful demonstrations of this kind.

Mr. J. A. MACKENTIRE, referring to Mr. Blok's remarks on the question of standards, said that no doubt Mr. Bush agreed with their desirability in principle. But he was also aware of the difficulties involved and the need for care in their preparation. During recent years efforts had been made to apply standards for various purposes, but in general such standards were necessarily below the average for the process concerned, and there was a tendency, if standards were imposed, for the minimum in theory to become the maximum in practice. He agreed that demonstrations such as those witnessed constituted an excellent method of training the public in matters of illumination; the best method was to let people see for themselves the advantages of the methods proposed.

Like Mr. Blok, he had found that he was always learning in matters of illumination. During recent years he had been dealing with the lighting of sub-basement rooms, and had found this a difficult problem. In some cases the occupants desired to utilize such daylight as was received from windows and to supplement this by artificial lighting. One method of achieving this was the introduction of artificial windows; alternatively artificially lighted panels might be adopted at intervals round the room. But the psychological aspects of such methods presented difficulties.

Mr. J. ECK congratulated Mr. Bush on his able address summarizing the activities of the Bureau. He believed that there was great scope for educational demonstrations in connection with street lighting. It was disconcerting to hear from friends in the United States of the great contracts, running into millions of dollars, which they had secured for public lighting. Contracts of such magnitude were unknown in this country, and there were few examples of pleasing and ornamental standards which were used in America on such a large scale.

The Bureau had done such excellent work in other directions that he would like them to concentrate attention on street lighting. They might, for instance, apply to this problem the method of devising small models, showing good and bad methods of lighting, which they had seen so successfully applied to factories and shops. He recalled that when the Society last visited the G.E.C. Research Laboratories at Wembley they were shown an experiment in this direction. The problem was rendered somewhat difficult by the fact that model installations of streets required more space. Such models might not at once carry conviction, but they should be useful in interesting street-lighting authorities and giving them some idea of the objects to be aimed at.

Captain W. J. A. LIBERTY expressed his interest in the idea of the model street. He hoped that this would be followed up by Mr. Bush. At the same time, it was obvious that it was difficult to deal with this problem with small-scale models, and there was much to be said for actual demonstrations on experimental roads, such as those which he hoped would shortly be witnessed at Wembley and at the National Physical Laboratory. He might also mention that arrangements were being made for a forthcoming demonstration in Sheffield, where, it was hoped, a section of street a mile and a half long would be set aside for experiments on the lines of the B.E.S.A. speciffication.

He had been familiar with the work of the Bureau since its commencement, and on every occasion on which he had paid a visit he had been struck by the progress made He, too, wished to compliment Mr. Bush on his interesting address.

Mr. L. E. BUCKELL remarked that the chief feature of Mr. Bush's address was his exposition of a new method of presenting facts about lighting; it might be described as "showing" instead of "telling." It would be generally agreed that the Bureau deserved great credit for initiating better methods of lighting, and much of the progress made during the last three or four years could be traced to their efforts. The Bureau worked on the sound principle of translating into simple language the scientific work of the illuminating engineer; or, better still, conveying these lessons by visible demonstrations, so that they could understand matters which might otherwise appear too involved or technical. This was a most valuable function, for the utility of scientific work was largely lost if the results obtained were hidden by scientific language and were not available to the man in the street.

Possibly the great advance in methods during the last few years was not yet sufficiently realized. Until a few years ago efforts to improve illumination usually resolved themselves into schemes for increasing the light. If an installation was unsatisfactory the consumer was merely encouraged to "pile up the watts," though in doing so he might increase the glare more rapidly than he increased the illumination, so that most of the advantage of his expenditure was lost. The Bureau had initiated the policy of broadcasting the principles of good lighting, so that the increased light would be wisely used.

He agreed with the remark made by Mr. Mackentire that a compulsory minimum of illumination was apt in practice to become the maximum. An official standard was necessarily low compared with the best practice, and, in general, people were more likely to increase their illumination voluntarily if it were shown to be to their advantage to do so. Much also remained to be learned regarding the psychological effect of light. Good lighting did not merely enable people to see better but also created a more cheerful frame of mind. This aspect had a direct bearing on the fixing of compulsory

standards. They had seen that evening a practical demonstration that a conviction based on actual experience of the advantages of good illumination was better than compulsion.

Mr. W. C. RAFFÉ said that during the last twelve months he had been examining many illustrations and samples of French and German fittings, and also some specimens of Italian work. In some respects the trend of developments seemed to be on different lines to those adopted in this country. It would be interesting to have an exhibition of British and Continental fittings side by side, so that they could be compared.

He agreed that it was premature to attempt to fix compulsory standards of illumination in industry. Generally speaking, he was opposed to compulsion, and other methods of influencing people should be adopted. Possibly, for example, insurance companies could be induced to grant more favourable rates to factories that were well illuminated. He suggested hospital lighting as a field where improvement was badly needed. In visiting one London hospital recently he had been unfavourably struck by the poor lighting arrangements. Whilst many hospital authorities were devoting much attention to the use of light as a curative agency, the importance of good general lighting did not seem to be appreciated. It was quite as necessary to give patients good lighting all the time as it was to subject them to special lighting for a short period as a course of medical treatment.

The CHAIRMAN (Mr. C. C. Paterson), in proposing a cordial vote of thanks to Mr. Bush for his address, and to the E.L.M.A. Lighting Service Bureau for their hospitality, referred to the very wide range of subjects dealt with during the evening. If he might mention yet another novel application of light, he would like to draw attention to the beautiful effects that could be obtained by floodlighting gardens at night. During the last two years he had been experimenting in this direction, and the results had been a revelation to him. Whilst he recognized that it would tax Mr. Bush's ingenuity to show anything of this kind on the premises, it would form a most effective demonstration if it could be done.

Mr. W. E. BUSH, in returning thanks, said that the E.L.M.A. Lighting Service Bureau were very pleased that the Society had visited the Department, and that members had been interested in the demonstrations. The question of arranging model demonstrations of street lighting was being examined. In regard to standards, he thought that they had served a useful purpose as a safeguard to health and safety; but, as had been pointed out, a compulsory minimum was liable in practice to become the actual maximum. He thought that the best course was to make recommendations from time to time, according to the progress in lighting, and to take every opportunity of impressing on the consumer the desirability of good lighting in his own interest.

Ordinarily it required something like a week to deal with the full range of illumination matters coming within the province of the Bureau. Those present would therefore understand that it was difficult to give even an outline of its activities in the course of an address lasting about an hour, and many topics had necessarily been treated very briefly.

International Illumination Congress in the United States

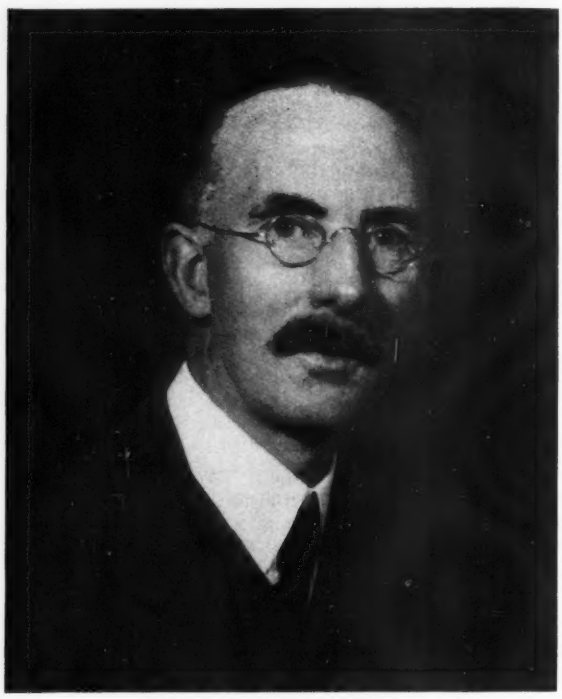
We have received some particulars of the above congress, which will include a tour of various American cities commencing on September 7th, the twenty-second annual convention of the Illuminating Engineering Society (U.S.A.), to be held in Toronto, September 17th–20th, and the eighth session of the International Commission on Illumination, to be held at Saranac Inn, N.Y., from September 22nd to 28th.

International Commission on Illumination

IN September next an important meeting of the International Illumination Commission, which was formed in 1900 and includes both the gas and electrical interests, is to be held in America. The objects of the Commission are the study of all subjects bearing on illumination and its cognate sciences, and the establishment of international agreements on illumination.

There are at present National Illumination Committees in Austria, Belgium, France, Germany, Great Britain, Holland, Italy, Japan, Switzerland and the United States of America.

For the first time in the history of the Commission, a British President has been elected, Mr. C. C. Paterson, O.B.E., Director of the Research Laboratories of the General Electric Co., Wembley, having been unanimously voted President at the Bellagio meeting in September, 1927.



Mr. C. C. PATERSON, O.B.E.,
President of the International Illumination Commission.

The Commission has already established an International Standard of Light, and the following subjects are now being dealt with, to which will be added from time to time other important matters associated with the study of illumination engineering: Vocabulary, definitions and symbols, factory and school lighting, automobile headlights, heterochromatic photometry, street lighting, signal glasses, diffusing materials, photometric test plates, photometric accuracy, etc., light flux distribution, daylight illumination, cinema lighting, fundamental research on glare, colorimetry.

The British National Illumination Committee, which is closely associated with the Sectional Illumination Committee of the British Engineering Standards Association, the membership being practically identical, and which will be responsible for nominating delegates to represent the British viewpoint and British interests, is very anxious to secure adequate representation at these meetings. It is hoped that the delegates will include representatives of the Government Departments, the municipalities, the National Physical Laboratory, the electrical industry, the gas industry, and the principal associations interested in illumination matters, and an urgent appeal is made to those bodies to provide the representation desired. Mr. Buckley, of the National Physical Laboratory, Teddington, who is the Secretary of the British National Illumination Committee, will gladly furnish full particulars.

POPULAR & TRADE SECTION

COMPRISING

Installation Topics—Hygiene and Safety—Data for Contractors—Hints to Consumers

(The matter in this section does not form part of the official Transactions of the Illuminating Engineering Society; and is based on outside contributions.)

Methods of Calculating General Illumination Intensities for Interiors

By IMRIE SMITH, B.Sc.
(E.L.M.A. Lighting Service Bureau.)

(Continued from page 88, March, 1928.)

AS has been pointed out previously the "watts per square foot" method, although representing almost the ideal in simplicity, contains many inaccuracies. The development of the lumen method was carried out with the object of retaining this simplicity so far as possible, but of introducing the necessary refinements to obtain greater accuracy. The problem was approached purely from the point of view of its practical application, and full advantage was taken of the gradual trend towards more or less standard types of electric lighting equipment.

The even illumination of a horizontal plane was taken as a basis, and as experience has established the employment of the spacing ratio for existing apparatus to produce even illumination, it was simply stipulated that the units should be employed at the heights and spacings recommended by the manufacturers, and the research was carried out on the system as a whole.

The next step consisted of stating the number of lumens required on the plane of work as a fraction of the lumens generated by the lamps, and so obviate the inaccuracies obtained by assuming a constant relationship between the wattage input and light output of various lamps as is done in the "watts per square foot" method.

It now remained to determine the correct values of these ratios for various types of fittings under different conditions; these ratios were named coefficients of utilization.

For the purposes of the analysis the illumination on the plane of work was assumed to consist of three components:—

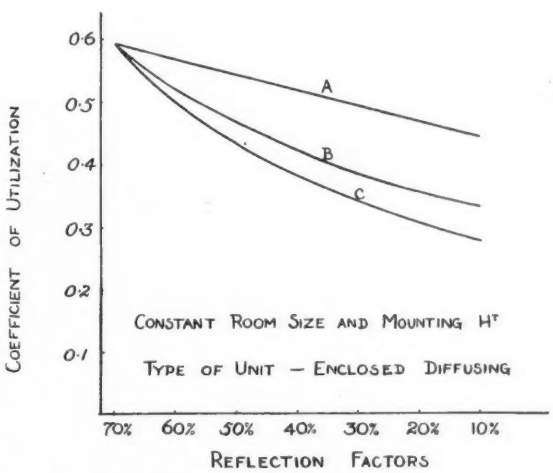
(*a*) Illumination provided directly from the unit.

(*b*) Illumination provided by reflection from the ceiling.

(*c*) Illumination provided by reflection from the walls.

In order to discover the influence of walls and ceilings of different reflection factors on the resultant illumination exhaustive experiments were carried out on a *square* room, the walls and ceiling of which were so arranged as to permit a large number of changes in their reflection factors.

Having thoroughly examined the influence of the walls and ceiling on the installation for a particular type of fittings, the experiments were repeated with various other types, and so a range of suitable coefficients was obtained. An example of such variations is shown in Fig. 1.



A. Walls 70 per cent. Reflection—Ceiling varying.
B. Ceiling 70 per cent. Reflection—Walls varying.
C. Ceiling and Walls both varying.

FIG. 1.—Showing Influence of Reflection Factor on Coefficient of Utilization.

At this stage the matter may be said to stand as follows:—

Lumens on plane of work for a given room =
Lumens generated × coefficient of utilization. (now determined)

As one lumen per square foot produces an average illumination of one foot-candle, we have:—

Lumens required on plane of work =
Required foot-candles × area of plane of work.

For the convenience of the designer the previous expression can now be stated in the form:—

Total luminous output of lamps =

$$\frac{\text{Required foot-candles} \times \text{area of plane of work}}{\text{coefficient of utilization}}$$

Dividing both sides by the number of points we get:

Lumens required per point =

$$\frac{\text{Area per point} \times \text{intensity required}}{\text{coefficient of utilization}}$$

It will be obvious that for the particular installation it becomes a simple matter to calculate the lumens required per point, and from tables of the illumination outputs of various sizes of lamps to obtain the requisite lamp size to produce the wanted illumination.

It will be readily understood that with a given type of unit the illumination contributed by reflection from the walls and ceiling will vary with the room proportions and the mounting height adopted. The next step was to investigate the necessary modifications to the coefficients of utilization to take such changes into account. This investigation was carried out by repeating the experiments with the installations previously examined but with various mounting heights and room dimensions, the reflection factors of the walls and ceiling being kept constant. After much investigation it was found possible to classify the coefficients of utilization according to the ratio of the width and length of the room and the mounting height* employed. This classification ratio is called the "room index."

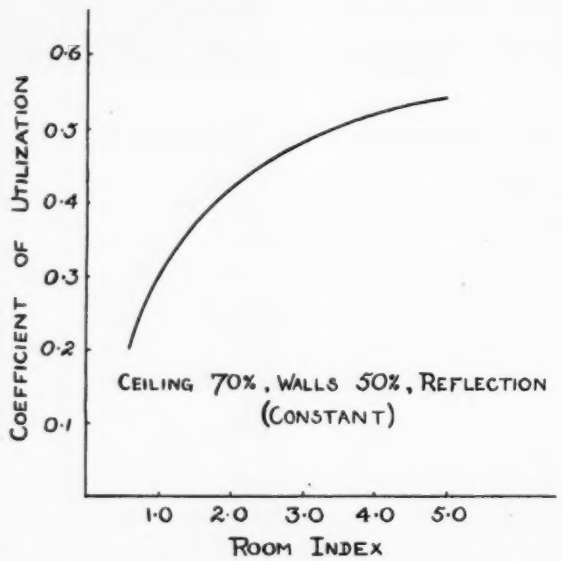


FIG. 2—Relation between Coefficient of Utilization and Room Index.

Thus the modification in the resultant illumination due to different reflection factors of the walls and ceiling, various room dimensions and mounting heights, are automatically combined in the one coefficient by plotting changes of coefficients of utilization against different room indices.

Variations of the coefficient of utilization with room indices for a particular fitting are shown in Fig. 2.

A further improvement has been made by the introduction of the depreciation factor, which is nothing more than the addition of 30 to 50 per cent. to the above light output in order to allow for deterioration of the reflecting surfaces of the room and fitting, and the ageing of the lamp. Our final equation takes the form of:—

$$\text{Lumens required per point} = \frac{\text{Area per point} \times \text{required foot-candles} \times \text{depreciation factor}}{\text{coefficient of utilization}}$$

It may be objected that it would be impossible to carry out the above-mentioned exhaustive tests for every fitting in order to obtain the requisite coefficients of utilization. Extensive testing is unnecessary, as the complete investigation succeeded in establishing relationships which permit the coefficient of utilization of any particular fitting to be calculated from an analysis of its polar curve. In practice there are many fittings which produce very similar results, and by taking advantage of this fact it is possible to compile tables of coefficients of utilization for a comparatively small number of types of fittings and yet to cover the majority of those in general use.

In the above scanty outline we have traced the development of a method whereby the designer can prepare an installation for a specific intensity of illumination by carrying out the following procedure:—

(1) Select the type of unit; mount and space them so as to provide even illumination.

(2) Calculate the area per point.

(3)*From tables of room dimensions and mounting height find the room index.

(4) Assess the reflection factors (within limits) of the ceiling and walls. (Very light, fairly light, fairly dark, very dark.)

(5) Find the coefficient of utilization from the appropriate tables of room indices and the reflection factors of walls and ceilings.

(6) Substitute in the equation:—

$$\text{Lumens required per point} = \frac{\text{Area per point} \times \text{required foot-candle} \times \text{depreciation factor}}{\text{coefficient of utilization}}$$

to obtain the illumination required per point.

(7) Consult tables showing the lumens output from various sizes of lamps in order to obtain the nearest lamp size which produces the illumination required.

It should be noted that by employing suitable tables allowances have been made for all the factors mentioned above, and that only two simple calculations have had to be made to obtain the complete solution.

An important feature is the fact that the answer is of a definite nature, and trial and error methods have been obviated.

* Ceiling height in the case of indirect systems.

The Maintenance of Signs

The illustration below shows very strikingly the importance of proper maintenance of signs, which was discussed by Mr. H. Lingard in our February number.

Of the whole sign only a part has been cleaned, with the result that the words "Eat more Fruit" come out boldly, but the subsequent and essential part of this slogan "and Keep Fit" is almost lost in obscurity.

An example of a Sign, only part of which has been cleaned.

Consumers generally do not appreciate sufficiently the need for regular maintenance of signs, which are exposed to the smoky city atmosphere and need even more attention than indoor installations. Periodical cleaning is necessary and it is also desirable to keep an eye on the lamps and to see that occasional failures are promptly replaced.

* Copies of Handbook No. 2a, which contains all the tables necessary for the use of the lumen method, can be obtained from the Lighting Service Bureau, 15, Savoy Street.

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Seventeenth Illumination Design Conference

To be held at the E.L.M.A. Lighting Service Bureau, April 30th—May 4th, 1928

Particulars have reached us of the forthcoming seventeenth Illumination Design Conference, now being organized by the E.L.M.A. Lighting Service Bureau, which is to take place during April 30th to May 4th.

A View of the Lecture Theatre and Group of those attending the E.L.M.A. Illumination Design Course at work.

This will differ in several respects from the Illumination Design Courses previously held. The work will be of a rather more advanced character, and special attention will be devoted to the solution of practical problems. Moreover the lectures will, in every instance, be different from those delivered previously. Full advantage will be taken of the new demonstration rooms, only recently completed and exhibited publicly for the first time on the occasion of the recent visit of members of the Illuminating Engineering Society. Visits will be paid to factories for the purpose of inspecting lighting installations on the spot and opportunities of examining the lighting of shops, streets and theatres are also contemplated.

There are about twenty lectures on the programme, and these cover a wide ground, such subjects as Light and Visibility, the Lighting of Schools, Offices, Homes, Streets and various classes of Factories, Floodlighting, Electric Advertising, Architectural Lighting, etc., being included.

The programme includes visits to several well-lighted factories in the London area, to leading electrical supply showrooms, and also to the National Physical Laboratory. The conference should prove both instructive and enjoyable, and doubtless also attractive. Those interested should apply for fuller particulars to the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, W.C.

The E.D.A. Annual Dinner

The annual dinner of the E.D.A., held at the Savoy Hotel, London, on March 16th, was, as usual, an enjoyable and interesting event. There was a large and representative gathering which—we believe for the first time—included ladies amongst the guests. Mr. J. M. Gatti, J.P., M.A., presided. The chief toast of the evening, "The Greater Use of Electricity," was entrusted to Mr. Archibald Page, President of the Institution of Electrical Engineers and Chief Engineer to the Central Electricity Board. Mr. Page outlined the constructive policy that had been initiated in regard to generation and transmission. Generation on a great scale would naturally affect the cost of electricity. Cheapness, in this as in other fields, was largely a matter of quantity. Capital hitherto spent on generation could be applied to financing showrooms, assisting wiring and encouraging the more general use of electricity. This was the task which the E.D.A. were undertaking. Mr. Page drew a picture of the changed conditions likely to result from the more widespread use of electricity, pointing out its value in the interests of health and cleanliness and the sacrifice of beauty which had been a feature of the steam age.

Mr. J. M. Gatti, in responding, recalled the early days of electricity and remarked on the great growth of the industry, for which figures were given. He drew attention to certain fallacies involved in comparisons between the cost of electricity in the United States and in this country, but foreshadowed decreased cost in the future.

Mr. Llewellyn B. Atkinson, who proposed the toast of "Our Guests," remarked how the E.D.A. had progressed from small luncheons to a banquet, and drew attention to the presence of a number of the early pioneers in electrical work, amongst whom he mentioned specially Colonel Crompton and Dr. Ferranti. Mr. Frank Hodges, who responded, pointed out that the expansion of the electrical industry was of great importance to the prosperity of others. He contended that the impression that the greater use of electricity would be bad for the coal trade was quite mistaken; it was precisely in those countries where the use of electricity was greatest that coal was most in demand.

The evening was concluded by a musical programme under the direction of Mr. Victor Marmont.

The Electrical Association for Women

THIRD ANNUAL CONFERENCE.

We note that the third annual conference of the Electrical Association for Women is to be held in London during April 17th and 18th. The annual general meeting will be held at the Institution of Electrical Engineers on April 17th, at 11-15 a.m., and this will be followed by a visit to the London Light Clinic (Humanity House, Ranelagh Road), at 3 p.m. In the evening a ball commencing at 9 p.m., has been arranged at the Hotel Cecil.

The proceedings on the second day (April 18th) include a visit to the New Electrical Installation at the Zoological Gardens at 11 a.m., and a lecture on "Technical Problems of Broadcasting" in the afternoon at 3 p.m.

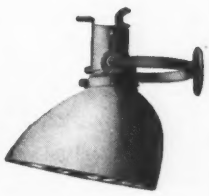
Sheffield Illumination Society

About 50 members of the Sheffield Illumination Society paid a visit to the works of Messrs. Walker & Hall Ltd. on March 28th.

The party was conducted through the many departments of the firm by guides, who explained in detail the various processes in the manufacture of silverware and cutlery, for which the firm is renowned, and a most interesting and educative afternoon was spent in this manner.

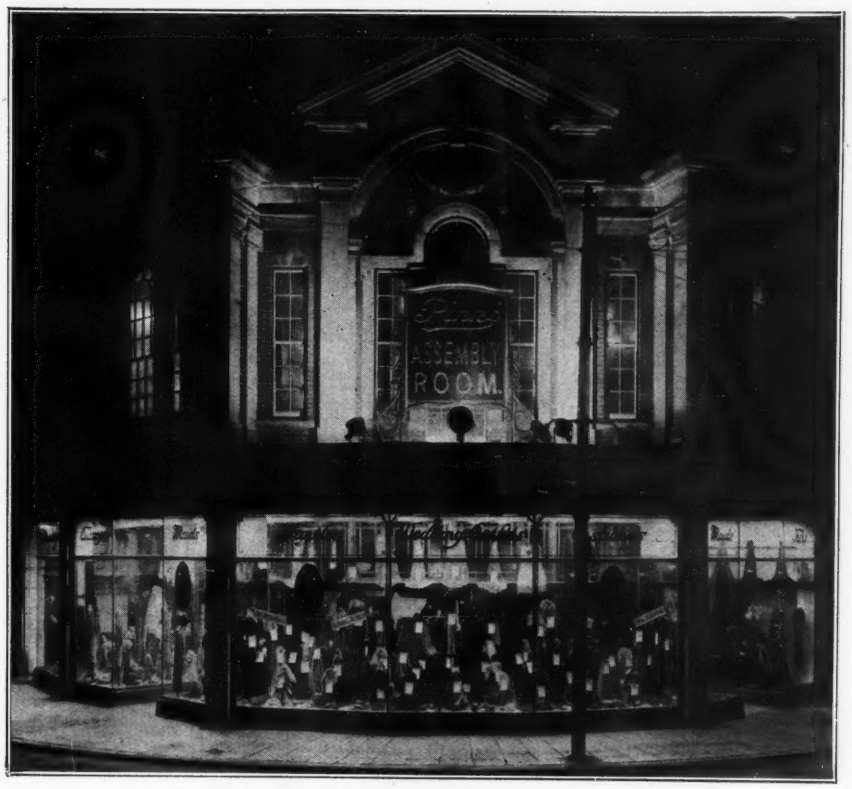
KANDEM FITTINGS

INSIDE AND OUTSIDE



Illumination of Display Window by KANDEM "WINLUX" Reflectors, Pattern 634 fitted with 100 watt and Gas-filled lamps.

Floodlighting of upper part of building by KANDEM Floodlight Projectors, one Pattern 3 fitted with Standard Gas-filled lamp of 1000 watts and two Pattern 2 each with 500 watt Standard Gas-filled lamp.



KANDEM "WINLUX" REFLECTORS WITH FOCUSSING GALLERIES are made in 3 sizes, PATTERN 612 for 60-150 watts, PATTERN 634 for 100-200 watts, PATTERN 616 for 300-500 watts.

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Gas at the Ideal Home Exhibition

Valuable Aids to Smoke Abatement

ONE of the most attractive exhibits this year at the Ideal Home Exhibition at Olympia was in the external form of an English castle. The interior gave the reason underlying the external design. It was the Englishman's home. Through beautiful leaded windows visitors could see ideal equipment for the kitchen, bedroom, bathroom and living rooms.

The All-enamel Gas Cooker.

For the kitchen there was a gas cooker enamelled in a finish that would not crack or burn or stain; it could be cleaned in a few minutes with nothing more than a quick wash down with hot water and soda. Its pleasant grey and white surfaces and simple compact lines struck just that note which makes all the difference between machinery and furniture.

In detail it embodied everything that is newest and best in the things which make for perfect and easy cooking, including an automatic temperature regulator. The hotplate and oven could be dismantled for cleaning purposes in less than a minute. In one of the models shown on another stand at the exhibition, the hotplate and oven were alongside, and on the same level—well raised above the floor for convenience and comfort in use. This is the kind which will find favour in every kitchen when working space permits—and it will, in all but the smallest. The oven hob gives additional space for pans and kettles, which can be moved clear of the hotplate without lifting. Half of the hotplate has a semi-solid top—a great advantage when the utensils placed over the boiling rings are small. A plate rack and a gas-heated warming chamber (beneath the hotplate) complete an attractive kitchen appliance which is going to make simple cooking without waste a matter of course in every home where it is used.

Ice from Gas.

Near the gas cooker on the "English Castle" exhibit was also to be seen a refrigerator which is the essence of simplicity. It has no motors, no valves, no machinery to go wrong. A bypass is lighted, a tap is turned on, and refrigeration is the result. Food can be kept in perfect condition in the summer, small blocks of ice can fresh—and all at a cost of about 1½d. a day for gas.

Gas irons, a gas refuse destructor, gas wash boilers, a circulator, a small sink geyser, and suitable gas lighting fittings completed the gas equipment of the kitchen.

Greenhouse and Garage Heating.

For the amateur gardener there was a little gas-heated greenhouse boiler with which he could keep the frost from his plants without undertaking stoking operations. Another item of interest was a radiator which could be used for heating rooms where fireplaces do not exist. It is also suitable for heating garages. Absolutely safe near petrol, it has been passed by Fire Insurance Companies for the purpose. All products of combustion are discharged into the open air, and all air required to support combustion is drawn into the radiator from outside through a very small hole made in the wall.

A Solid Fuel Smokeless Fire.

Another great attraction was a new domestic coke-burning grate. The fire was beautifully bright and warm and the slight difficulty experienced in lighting coke had been overcome by the fixing of a special gas burner inside the grate. Thus by turning a tap placed at a convenient point at the side of the fireplace and applying a match to the burner, the fire could be lighted up as easily as a gas fire, and in about twenty minutes the gas burner could be turned out. Those who still have a love for the solid fuel fire, but who detest the smoke and dirt from coal, should find exactly what they want in this grate.

A New Wireless Discovery.

Wireless "fans" were interested in an invention which eliminates the need of batteries even in districts where there are no electric mains. This device utilizes the heat of a small gas burner to generate electrical energy. The thermo-electrical generator is made up of compound metal strips connected in series. One end of each thermo-couple is heated, while the other remains cold. The difference in the two temperatures sets up a steady flow of an electric current, and as long as the difference of temperature exists so long will the thermo-couples generate an electric current. The gas consumption is approximately 8 cub. ft. per hour, and the electricity generated is sufficient to operate any wireless set employing modern valves of low consumption.

The dining room of the exhibit of the London Gas Companies at the "Ideal Home" Exhibition, showing silk-shaded gas brackets, a pendant and a small table lamp. The brackets and the pendant are operated by switches.

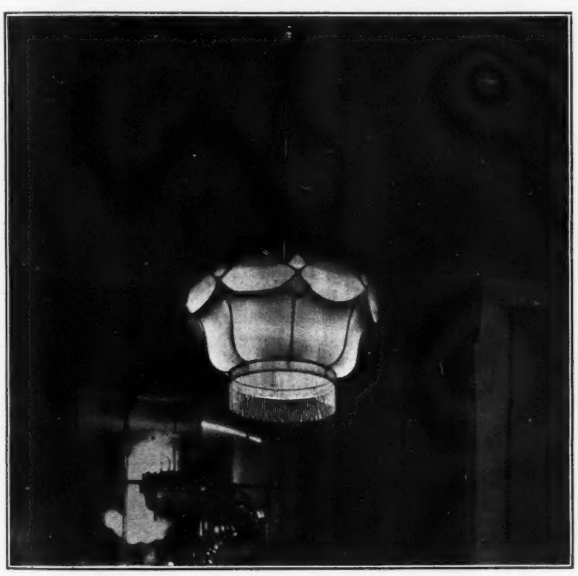
Heat Rays for Tubercular Patients.

Another item which attracted medical men and women to the exhibit was a special lamp for providing tubercular patients with heat rays derived from gas burning on the surfaces of radiating mantles. This lamp is the outcome of a large amount of research work carried out under the direction of the Medical Superintendent of Treloar's Cripple Homes at Alton, Hampshire. While the full value of this addition to the radio-therapeutic treatment of tuberculosis patients has not yet been finally established, all friends of those who are visited with this terrible disease will be glad to hear of any new research work being undertaken on their behalf.

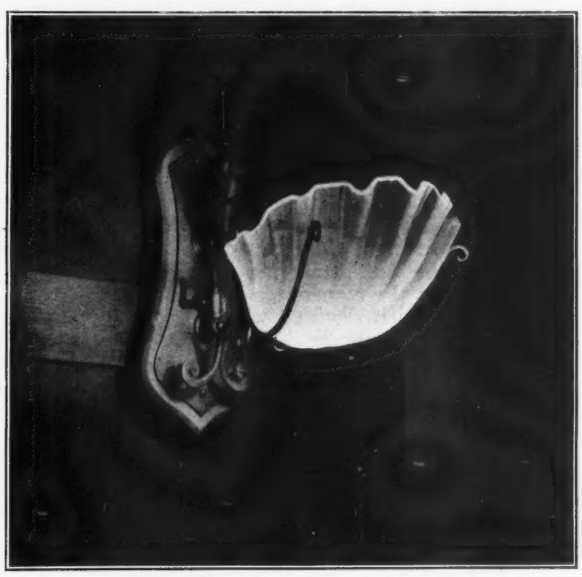
It is to be hoped that the same product which has done so much to reduce the smoke nuisance and so to increase the hours of health-giving sunshine will also prove capable of bringing appreciable relief to those who are suffering from the dreaded "diseases of darkness."

All the Gas-lighting Fittings on the London Gas Companies' "Ideal Home" Exhibit were turned on and off by switches.

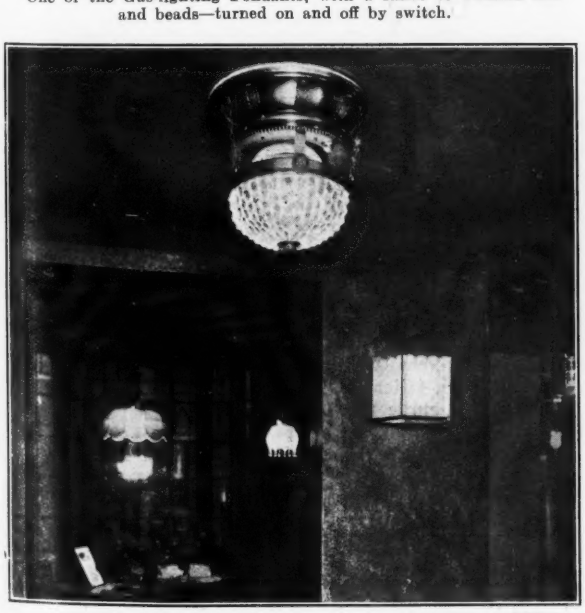
A Silk-shaded Standard Gas Lamp of dignified design; one of the fittings shown on the London Gas Companies' Exhibit.



One of the Gas-lighting Pendants, with a shade of watered silk and beads—turned on and off by switch.



A beautiful Gas-lighting Bracket, with a shell-shaped shade of an attractive design.



A Ventilating Ceiling Gas Light with cut-glass bowl; suitable for halls, offices and public buildings

A corner of the "All-Gas" Kitchen, showing gas iron, gas-operated refrigerator and gas-lighting bracket.

A Travelling Showroom

The urgent need for more showrooms has been clearly appreciated both by the gas and electrical industries during recent years, and a number of well-equipped demonstration centres have come into being. It is evident, however, that there are many areas where the cost of upkeep would be prohibitive—particularly in rural and relatively sparsely populated districts, where the amount of custom at present available is not very large.

At the same time such areas should not be neglected. For sections of the country to be allowed to get out of touch with the latest developments of gas and electric lighting is clearly inadvisable. In *The Gas Journal* an ingenious device for overcoming this difficulty—the travelling showroom—has recently been described. The idea is due to the ingenuity of Mr. Harold E. Bloor, engineer, secretary, and manager of the York Gas Company. The showroom consists of a substantial van 21 feet long. With the aid of a double extension a floor 20 feet square can be provided. The interior is designed as a real showroom. Lighting appliances, fires, cookers and water heaters can all be demonstrated. Already this "travelling showroom" seems to have done excellent work. During 80 days of active service in five districts it has received 1,763 visitors, and canvassing calls on 1,703 people have been made. As the aggregate of consumers in the area covered is only 2,052, this seems a good performance, and no doubt satisfactory business will result.

"Corner Lights"

During recent years there has been a certain tendency to revert to wall fittings, especially abroad, where much ingenuity has been expended on the design of original and decorative devices. A somewhat newer tendency, recorded in *Licht und Lampe*, is the design of "corner lights," i.e., fittings which answer similar purposes to wall brackets but are installed in the corners of the room. In many rooms the corners lend themselves well to the installation of such devices, which may take the form either of metal fittings or diffusing-glass panels with a wooden framework, mounted transversely across the corner of the room. There seems a certain amount of justification for adopting such local units to supplement lighting from a central bowl, as the corners of rooms are naturally the portions which are least well illuminated. Moreover, corner spaces are not readily utilized for other purposes, whereas wall brackets may occupy space destined for pictures, etc.

Fixtures are "Furniture"

An article in *The Electrical Record* recently drew attention to the curious way of regarding lighting fixtures as part of the items entering into building construction. Hence the practice, even endorsed in the electrical industry, of assuming, say, 3 per cent. to be added to the building budget for lighting fixtures. It is asked whether the time has not yet come when lighting fittings should be allotted their proper place as part of the furniture of the home. Long before the days of gas candlesticks were regarded as decorative furniture. Similarly householders should be led to take a pride in modern lighting fittings, purchasing them as part of the furniture of the home and choosing them with taste and care.

Wholesale Fittings Company Dinner

The first of what is hoped to be a series of annual staff dinners of the Wholesale Fittings Co. Ltd., 23/27, Commercial Street, London, E.1, was held at the Three Nuns Hotel, Aldgate, on Saturday, February 18th, with Mr. John Altman, managing director, in the chair. He proposed the health of the staff, and Mr. John Isaacs, in reply, thanked the directors for a pleasant evening. Mr. F. C. Barnett, director, gave "The Guests," to which Mr. E. Rosen, of Ultra Electric Ltd., replied. Mr. Stephens submitted "The Chairman." The proceedings were enlivened by an excellent musical programme arranged by Mr. West.

Lighting at the Trocadero Restaurant

There is much of interest in the new system of lighting just installed in the Empire and Alexandra Rooms at the Trocadero Restaurant.

The fittings themselves strike an entirely new note, and yet are simple in character. The metalwork of the frames is light and delicate in treatment, and carries attractive art glass panels of an amber tint, this tint having the effect of giving the illumination a warmth and softness similar to sunshine. At the same time there is no semblance of shadow.

G.E.C. Lighting at the Trocadero Restaurant.

Some detailed particulars of these fittings may be of interest. The wall fittings are 24 inches in diameter, and are equipped with Osram flame-tint sprayed lamps. Each is installed in the centre of a decorated wall panel, with lines of radiation which seem to suggest a "sunburst."

Within each of the 24 richly decorated ceiling panels is a lighting unit 25 inches in diameter. The upper portion of each of these units houses eight 20-watt lamps, with a single lamp in the lower section, each section being wired on a separate circuit.

The large pendant fittings are modelled on similar lines to the ceiling panel units referred to above, but have curved amber panels and gilt metalwork. Each unit measures 3 feet 6 inches in diameter overall, and accommodates seventeen 40-watt lamps, eight being housed in each of the upper and centre sections, with one in the lower section, each section being wired on a separate circuit.

These fittings were all supplied by the General Electric Co. Ltd., to the designs of, and in collaboration with, Mr. Oliver Bernard.

Maxims for Illuminating Engineers

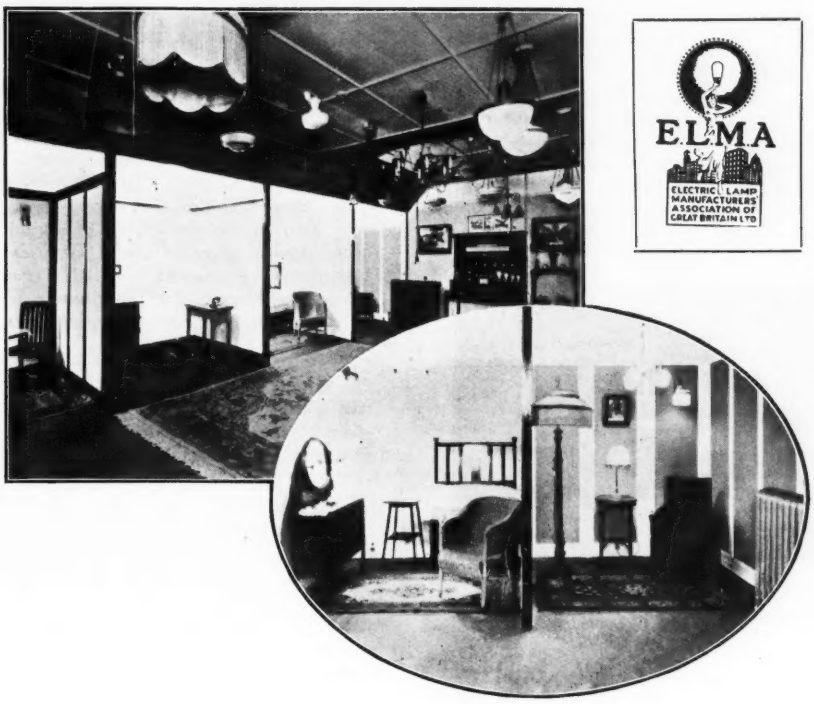
At the Provincial Conference of the Institute of Ophthalmic Opticians, held last year in Keswick, Mr. J. P. Fry, the representative of the Australian Optical Association, concluded his remarks by quoting two verses of poetry, one of which ("Climbing") we reproduce below:—

CLIMBING.

Who climbs the mountain does not always climb;
The winding road slants downward many a time.
Yet each descent is higher than the last.
Has thy path fallen? That will soon be past.
Beyond the curve the way leads up and on;
Think not thy goal for ever lost or gone.
Keep moving forward; if thine aim is right
Thou canst not miss the shining mountain height
Who would attain to summits still and fair
Must nerve himself through valleys of despair.

We think that the sentiments should commend themselves to those associated with the illuminating engineering movement, who have had their ups and downs like everyone else, but who have never lost faith in the upward trend of the movement.

The Lighting Service Bureau



The special demonstration cubicles illustrated above are one of the most useful features of the Bureau. They are furnished as dining room, kitchen, bedroom and lounge, and show old and new—bad and good—methods of lighting.

In addition, they are fitted with electroliers, bowl fittings, floor standards and portable lamps, so that, at a moment's notice, each particular method of lighting may be demonstrated and considered.

Lectures on any branch of electric lighting can be arranged by request.

THE LIGHTING SERVICE BUREAU

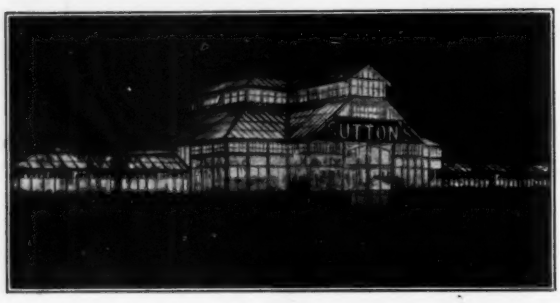
15, Savoy Street, Strand, LONDON, W.C.2

Issued by the Electric Lamp Manufacturers' Association.

TRADE NOTES & ANNOUNCEMENTS

AN EFFECTIVE FLOODLIGHTING INSTALLATION.

It is generally accepted that the most effective floodlighting installations are usually secured when the building illuminated stands apart, so that it can be viewed from a distance without obstruction by neighbouring buildings. The treatment of Messrs. Sutton & Sons' Royal Seed Establishment at Reading, adjoining the main G.W.R. line from Paddington, is an instance. When floodlighted at night this is a conspicuous landmark to travellers on the G.W.R. line. The



Showing Floodlighting of Messrs. Sutton & Sons' Royal Seed Establishment at Reading.

illumination of this glass structure, which was carried out by the staff of Messrs. Sutton's, utilizes a number of G.E.C. floodlight projectors, each equipped with 500-watt Osram gasfilled lamps. The whole of the building is flooded with light, and the external effect is supplemented by special interior illumination.

The accompanying illustration, which is from an untouched photograph taken solely by the illumination provided, gives a good idea of the striking effect secured.

A VISIT TO THE SUN ELECTRIC CO.'S SHOWROOMS.

During a recent visit to the above showrooms the writer was impressed by the progress made since his last call. The space available for display has been considerably increased during recent years, and the arrangements have been remodelled, a feature being the series of special " period " exhibits in model rooms ranged around the main showroom. There is on view a very comprehensive range of fittings, including many admirable examples of decorative diffusing glassware of novel design. The writer was struck by a pleasing form of unit for use over the dining-room table, with a disc of diffusing glass transmitting light downwards and a silk canopy, and also by some simple but effective portable candle fittings. A good feature of modern design is the tendency towards soft effects and absence of glare, and the variety of glassware now available leaves no excuse for the perpetuation of unsightly and dazzling effects.

The casual visitor to these showrooms probably does not realize another interesting feature—the very extensive underground area available for storage purposes which extends outwards under the street pavement. This enables practically all the stock desired to be assembled on the spot, so that anything is available at short notice.

FUME-PROOF LIGHTING UNITS.

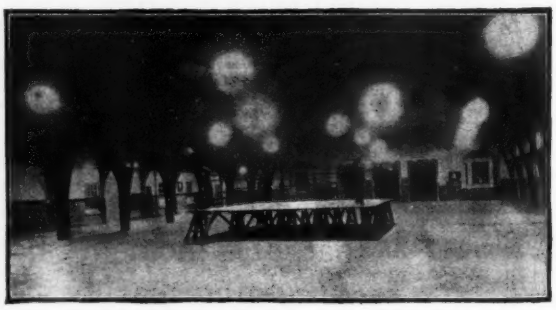
The lighting of factories which contain fume-laden or possibly explosive atmospheres has now become quite a special branch of illuminating engineering. Our attention has been drawn to this subject by the receipt of several new folders from Messrs. Heyes & Co., of Wigan, who have made a speciality of apparatus of this kind. All the units bear evidence of sound mechanical and robust construction, and are specially designed for use in places where space is limited. As an instance we may mention the new " Wigan " prismatic lamp fitting, which, although adapted to the use of 100–150-watt lamps, is only 6 inches deep. Units of this type, capable of being mounted direct on walls or ceiling have obvious possibilities. We believe that the units adopted for the lighting of the passage at Charing Cross Tube Station, which was commented upon in this journal some time ago, are of this standard type. The list contains other flame-proof, pendant and colliery fittings, and a range of useful electrical accessories, amongst which may be mentioned ironclad, flame-proof and water-tight pushes, switchboards and distribution boards, mechanical and electrical bells, transformer switch-plugs, etc.

LIGHTING A DRILL HALL.

An interesting application of the familiar B.T.H. " Glassteel " Diffuser industrial lighting unit is for the lighting of the Northampton Territorial Drill Hall.

Good lighting is naturally of importance as an aid to drill and physical training instruction, and the lighting conditions at the Northampton Drill Hall, illustrated in the adjacent photograph (taken entirely by the light provided by the installation), are considered particularly good. Every movement of the men on parade can be plainly seen by the instructor, while in musketry and aiming drill the good lighting renders it much easier for the men to carry out their practices.

For this installation 28 B.T.H. " Glassteel " Diffusers in conjunction with 300-watt Mazda gasfilled lamps were used. The total floor space is 8,500 square feet. Although there are a considerable number of girders and the roof has practically no reflecting value, the lighting is remarkably uniform. Every corner of the hall is amply illuminated, and there is no glare.



The Lighting of the Northampton Drill Hall with B.T.H. " Glassteel " Industrial Units.

On further reference to the illustration it will be observed that, at the time the photograph was taken, a boxing ring was in position in the centre of the hall. Special provision was made for this in designing the lighting scheme, as the general lighting, of course, would be switched off during a boxing contest. Illumination of the ring is obtained by means of four 200-watt gasfilled lamps in Mazdalux Rectangular Reflectors of B.T.H. design, suspended near each corner of the ring. These four units provide a very high intensity of illumination without glare or shadows—most essential features in the lighting of a boxing ring.

The complete scheme was designed at the request of the architect, Col. John Brown, St. Giles, Northampton, by the British Thomson-Houston Co., in association with the Northampton Electric Light and Power Co., who carried out the installation.

"K. & M." FLOODLIGHTING PROJECTORS AND HOARDING UNITS.

We have received from Messrs. Körting & Mathiesen Electrical Ltd. new lists relating to "K. & M." floodlight projectors, hoarding reflectors and Bell transformers. The floodlight projectors are in four distinct patterns, and of these there are three sizes, suitable for 150–209, 300–750 and 750–1,500 watt lamps. The largest size (No. 3) is furnished either with mirror or enamel reflecting surface. The leaflet is illustrated by attractive photographs of actual installations. The hoarding units have a somewhat unusual shape and are designed to furnish a polar curve of light distribution specially suited to work of this kind. These units are robust in construction, the cast iron canopy being stove enamelled in dark grey, and the reflector vitreous enamelled white inside and dark grey outside.

LONDON ELECTRIC FIRM.

An Interesting Order.

We are informed by the London Electric firm that an order for searchlights of exceptional size, namely, about 7 ft. diameter, has recently been received. These searchlights, it is stated, will be larger than any hitherto manufactured in this country and will be amongst the largest ever constructed. This firm has, however, quite a large amount of work of this kind on hand, including naval and other searchlights of the high intensity type, for home and foreign Governments, and also of the new "Super-Suez" type and of the Pilot House and commercial varieties down to 6 in. diameter.

THE BENJAMIN ONE-PIECE REFLECTOR.

This reflector—one of the novelties of last year—is attractively described and illustrated in a new leaflet issued by Benjamin Electric Ltd. of original and striking "get-up." the pages being bordered in green and the illustrations showing the relative sizes of these reflectors for lamps of 60 to 1,500 watts, also executed in this colour. Attention is drawn to its salient features, already recorded in this journal, and some hints on the design of industrial lighting installations are given.

CONTRACTS CLOSED.

The following contracts are announced :—

The General Electric Co Ltd. :—

London Midland & Scottish Railway, Belfast; for twelve months' requirements in Osram main lighting and standard lamps.

The Admiralty; for 53,200 Admiralty pattern cored filament lamps; 23,970 night sight and telephone exchange lamps.

BRITISH INDUSTRIES FAIR, BIRMINGHAM.

Welsbach Exhibit.

The exhibit of the Welsbach Light Co. Ltd. at the British Industries Fair, Birmingham, was arranged on comprehensive lines; a photograph of the stall which we have seen makes quite an attractive picture. One interesting item was an actual lighthouse burner used in conjunction with a lens panel similar in every respect to those used in various important lighthouses around the British Isles. This exhibit was loaned by Messrs. Chance Bros. & Co., of Birmingham. The mantle used is described as the largest in the world and measures 9 inches in height. The apparatus, including lens and mantle, is stated to yield approximately 78,000 candles. Adjacent to the lighthouse mantle was shown "the smallest gas mantle in the world," also exclusively manufactured by The Welsbach Light Co. Ltd. This is known as the "microscopic mantle" and is only ⅛ inch in height. It was shown in use with the Metro Glow-Light Burner manufactured and supplied by the South Metropolitan Gas Co. The lighting unit yields only 2 to 3 candles and is intended for service as a night light or pilot light. Around these two special exhibits a remarkable range of mantles of the most varied types was shown—probably one of the most extensive displays of this nature ever arranged in this country.

PATENTS.

The owners of British Patents: No. 169,947, relating to "Improvements in or relating to Prosceniums for Theatres or the Like"; No. 172,921, relating to "Improvements in or relating to Theatre-stages"; No. 178,413, relating to "Improvements in Means for Representing Optical Scenery and other Objects on Stages or the Like"; and No. 195,378, relating to "Improvements in Projecting Apparatus for the Projection of Panorama Views," are desirous of entering into negotiations with one or more firms in Great Britain for the purpose of exploiting the inventions either by sale of patent rights or by the grant of licences on reasonable terms. Interested parties who desire further particulars should apply to Dr. Albert L. Mond, 19, Southampton Buildings, Chancery Lane, London, W.C.2.

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THE ILLUMINATING ENGINEER (the Journal of GOOD LIGHTING) was founded in January, 1908, and has thus been in existence for twenty years.

SINCE the year 1909, when the Illuminating Engineering Society was founded in London, it has been the official organ of the Society.

IT is *the only journal in this country exclusively devoted to Lighting by all Illuminants.*

IT receives the assistance of contributors who are leading experts on illumination in this country and abroad. Foreign Notes and News will be a speciality, and correspondents have been appointed in all the chief cities of the world.

THE Journal contains *first-hand and authoritative information on all aspects of lighting;* it has also been improved and extended by the inclusion of a *Popular and Trade Section* containing special articles of interest to contractors, gas and electric supply companies, Government Departments and members of the Public.

DISCUSSIONS before the Illuminating Engineering Society which are reproduced in this Journal are participated in alike by experts on illumination and *users of light*, whose co-operation is specially invited.

Good Lighting is of interest to everyone. The Journal is read by engineers, architects, medical men, factory inspectors, managers of factories, educational authorities, public lighting authorities, and large users of light of all kinds.

BESIDES being issued to all members of the Illuminating Engineering Society, the Journal has an independent circulation amongst people interested in lighting in all parts of the world. The new and extended form of the Journal should result in a continual and rapid increase in circulation.

Every reader of THE ILLUMINATING ENGINEER, the Journal of GOOD LIGHTING, *is interested in illumination, and is a possible purchaser of lamps and lighting appliances. Gas and Electricity Supply Undertakings likewise benefit by the movement for Better Lighting, with which the Journal is associated, and which stimulates the demand for all illuminants.*

JOIN

The Illuminating Engineering Society.

Monthly meetings are held, at which interesting papers are read, and discussions on such subjects as the lighting of streets, factories, schools, libraries, shops, etc., and exhibits of new lamps and lighting appliances take place.

Members receive *The Illuminating Engineer*, the official organ of the Society, free.

The Society preserves an impartial platform for the discussion of all illuminants, and invites the co-operation both of experts on illumination and users of light; it includes amongst its members manufacturers, representatives of gas and electric supply companies, architects, medical men, factory inspectors, municipal officers, and many others interested in the use of light in the service of mankind.

The Centre for Information on Illumination.

For particulars apply to:

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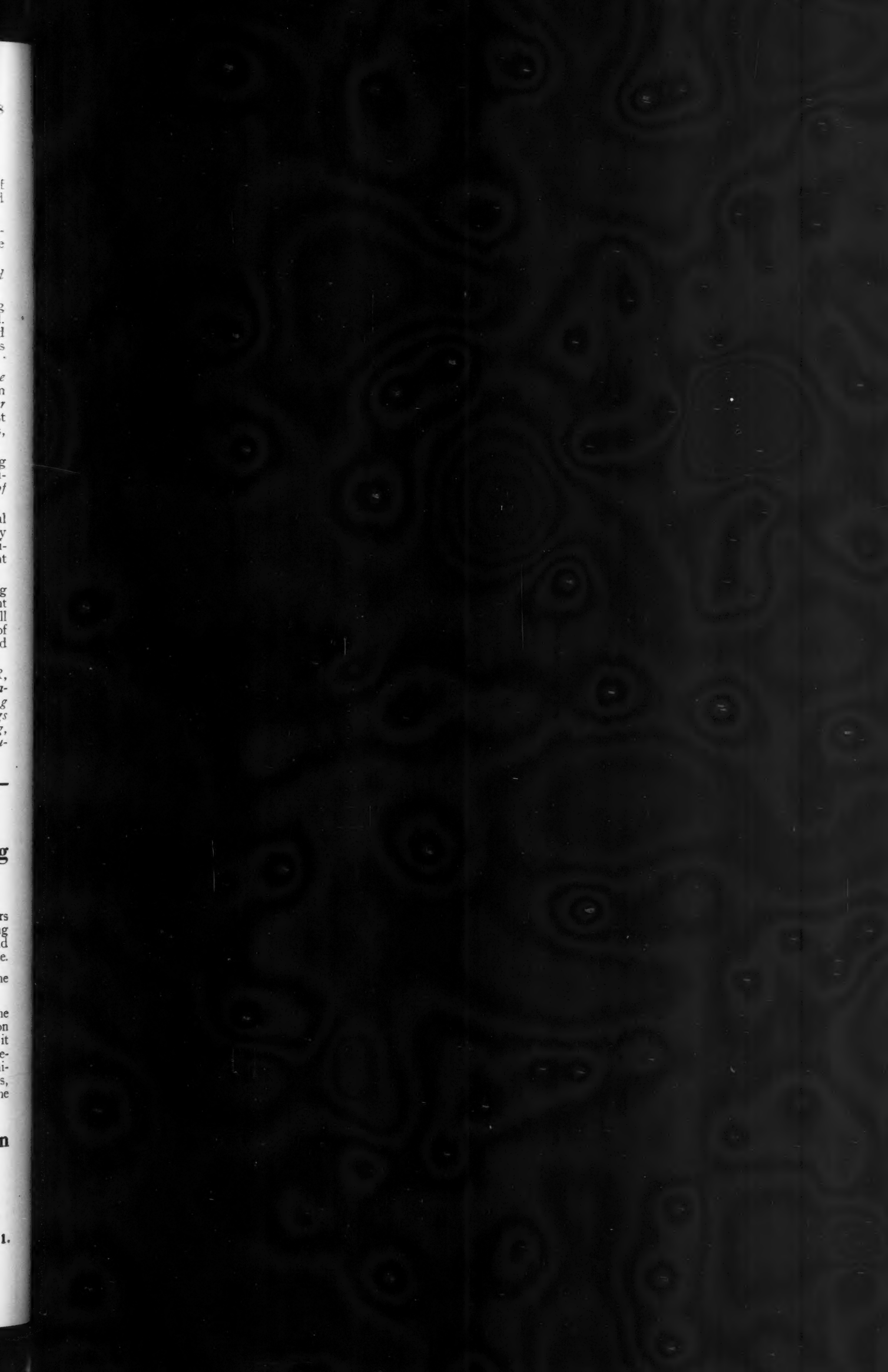
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